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PROGRESSIVE
PRACTICAL ARITHMETIC.

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K E Y

TO THE

P R O G R E S S I V E

PRACTICAL ARITHMETIC,

INCLUDING

ANALYSES OF THE MISCELLANEOUS EXAMPLES

IN THE

PROGRESSIVE INTELLECTUAL ARITHMETIC.

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District of New York.



P R E F A C E .

A **KEY** to any Mathematical work is not intended to supersede labor and study, but to give direction to the latter and make it more effective and useful.

In many examples and problems the same results may be obtained by different processes, but the shortest and most simple method is to be desired ; hence the object of a Key should be to give not results only, but the explanation of methods, and a full analysis of such questions as contain a peculiar application of principles involved.

It is supposed, of course, that every teacher is fully competent to solve all the questions, but with the multiplicity of duties ordinarily put upon the teacher, time cannot always be had to answer or solve all the questions presented by the pupil. Therefore the Key is intended to lessen the labor and save the time of the teacher by presenting the shortest solution, and the best form of analysis as a standard to which the pupil should be required to conform.

In compliance with the wishes of many teachers, brief analyses of the Miscellaneous Examples in the Intellectual Arithmetic have been added to the latter part of this work.

Much labor has been bestowed upon the present work to give a full, complete, and logical analysis of all difficult examples, and of such questions as contain the application of a new principle. The arrangement is such as to be easily understood.

KEY



NOTATION.

ROMAN NOTATION.

(17, page 9.)

Ex. 1. <i>Ans.</i> XI.	Ex. 2. <i>Ans.</i> XV.
Ex. 3. <i>Ans.</i> XXV.	Ex. 4. <i>Ans.</i> XXXIX.
Ex. 5. <i>Ans.</i> XLVIII.	Ex. 6. <i>Ans.</i> LXXVII.
Ex. 7. <i>Ans.</i> CLIX.	Ex. 8. <i>Ans.</i> DXCIV.
Ex. 9. <i>Ans.</i> MDXXXVIII.	Ex. 10. <i>Ans.</i> MDCCCCX.

ARABIC NOTATION.

(26, page 12.)

Ex. 1. <i>Ans.</i> 125.	Ex. 2. <i>Ans.</i> 483.	Ex. 3. <i>Ans.</i> 716.
Ex. 4. <i>Ans.</i> 900.	Ex. 5. <i>Ans.</i> 290.	Ex. 6. <i>Ans.</i> 809.
Ex. 7. <i>Ans.</i> 505.	Ex. 8. <i>Ans.</i> 557.	

(28, page 13.)

Ex. 1. <i>Ans.</i> 1200.	Ex. 2. <i>Ans.</i> 5160.	Ex. 3. <i>Ans.</i> 3741.
Ex. 4. <i>Ans.</i> 8056.	Ex. 5. <i>Ans.</i> 2090.	Ex. 6. <i>Ans.</i> 7009.
Ex. 7. <i>Ans.</i> 1001.	Ex. 8. <i>Ans.</i> 9427.	Ex. 9. <i>Ans.</i> 4035.
Ex. 10. <i>Ans.</i> 1904.		

Ex. 11. *Ans.* Seventy-six; one hundred twenty-eight; four hundred five; nine hundred ten; one hundred sixteen; three thousand four hundred sixteen; one thousand twenty-five.

Ex. 12. *Ans.* Two thousand one hundred; five thousand forty-seven; seven thousand nine; four thousand six hundred

seventy; three thousand nine hundred ninety seven; one thousand one.

(29, page 14.)

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|-----------------------------|-----------------------------|---------------------------|
| Ex. 1. <i>Ans.</i> 20000. | Ex. 2. <i>Ans.</i> 47000. | Ex. 3. <i>Ans.</i> 18100. |
| Ex. 4. <i>Ans.</i> 12350. | Ex. 5. <i>Ans.</i> 39522. | Ex. 6. <i>Ans.</i> 15206. |
| Ex. 7. <i>Ans.</i> 11024. | Ex. 8. <i>Ans.</i> 40010. | Ex. 9. <i>Ans.</i> 60600. |
| Ex. 10. <i>Ans.</i> 220000. | Ex. 11. <i>Ans.</i> 156000. | |
| Ex. 12. <i>Ans.</i> 840300. | Ex. 13. <i>Ans.</i> 501964. | |
| Ex. 14. <i>Ans.</i> 100100. | Ex. 15. <i>Ans.</i> 313313. | |
| Ex. 16. <i>Ans.</i> 718004. | Ex. 17. <i>Ans.</i> 100010. | |

Ex. 18. *Ans.* Five thousand six; twelve thousand three hundred four; ninety-six thousand seventy-one; five thousand four hundred seventy; two hundred three thousand four hundred ten.

Ex. 19. *Ans.* Thirty-six thousand seven hundred forty-one; four hundred thousand five hundred sixty; thirteen thousand sixty-one; forty-nine thousand; one hundred thousand ten.

Ex. 20. *Ans.* Two hundred thousand two hundred; seventy five thousand six hundred twenty; ninety thousand four hundred two; two hundred eighteen thousand ninety-four; one hundred thousand one hundred one.

(31, page 16.)

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|----------------------------------|--------------------------------|--------------------------|
| Ex 1. <i>Ans.</i> 140. | Ex. 2. <i>Ans.</i> 30201. | Ex. 3. <i>Ans.</i> 8050. |
| Ex 4. <i>Ans.</i> 2900417. | Ex. 5. <i>Ans.</i> 300040. | |
| Ex. 6. <i>Ans.</i> 96037009. | Ex. 7. <i>Ans.</i> 4064200150. | |
| Ex. 8. <i>Ans.</i> 846009350208. | | |

(34, p. 19.)

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|------------------------------|-------------------------------|
| Ex. 1. <i>Ans.</i> 436. | Ex. 2. <i>Ans.</i> 7164. |
| Ex. 3. <i>Ans.</i> 26026. | Ex. 4. <i>Ans.</i> 14280. |
| Ex. 5. <i>Ans.</i> 176000. | Ex. 6. <i>Ans.</i> 450039. |
| Ex. 7. <i>Ans.</i> 95000000. | Ex. 8. <i>Ans.</i> 433816149. |

- Ex. 9. *Ans.* 900090. Ex. 10. *Ans.* 10011010.
 Ex. 11. *Ans.* 61005000000. Ex. 12. *Ans.* 5080009000001.
 Ex. 13. *Ans.* Eight thousand two hundred forty.
 Ex. 14. *Ans.* Four hundred thousand nine hundred.
 Ex. 15. *Ans.* Three hundred eight.
 Ex. 16. *Ans.* Sixty thousand seven hundred twenty.
 Ex. 17. *Ans.* One thousand ten.
 Ex. 18. *Ans.* Fifty-seven million four hundred sixty-eight thousand one hundred thirty-nine.
 Ex. 19. *Ans.* Five thousand six hundred twenty-eight.
 Ex. 20. *Ans.* Eight hundred fifty million twenty-six thousand eight hundred.
 Ex. 21. *Ans.* Three hundred seventy thousand five.
 Ex. 22. *Ans.* Nine billion four hundred million seven hundred six thousand three hundred forty-two.
 Ex. 23. *Ans.* Thirty-eight million four hundred twenty-nine thousand five hundred twenty-six.
 Ex. 24. *Ans.* Seventy-four billion two hundred sixty-eight million one hundred thirteen thousand seven hundred fifty-nine.
 Ex. 25. *Ans.* 7000036.
 Ex. 26. *Ans.* 563004.
 Ex. 27. *Ans.* 1096000.
 Ex. 28. *Ans.* Nine billion four million eighty-two thousand five hundred one.
 Ex. 29. *Ans.* Two trillion five hundred eighty-four billion five hundred three million nine hundred sixty-two thousand forty-seven.
 Ex. 30. *Ans.* 3064152.
 Ex. 31. *Ans.* Two of the sixth order, 9 of the fifth, 6 of the third, 4 of the second, and 8 of the first.
 Ex. 32. *Ans.* One of the seventh order, 3 of the fifth order, 7 of the fourth order. and 5 of the second order.

ADDITION.

(40, page 21.)

Ex. 3. *Ans.* 698.Ex. 4. *Ans.* 967.Ex. 5. *Ans.* 898.

(42, page 24.)

Ex. 7. *Ans.* 1807.Ex. 8. *Ans.* 27246.Ex. 9. *Ans.* 4945.Ex. 10. *Ans.* 78313.Ex. 19. *Ans.* 145.Ex. 22. *Ans.* 69585.Ex. 23. *Ans.* 566.Ex. 24. *Ans.* 3746.Ex. 27. *Ans.* 4619.Ex. 28. *Ans.* 4915.Ex. 29. *Ans.* 4320.Ex. 30. *Ans.* 4623.Ex. 31. *Ans.* 3871.Ex. 35. *Ans.* 101500.Ex. 37. *Ans.* 50000000.Ex. 40. *Ans.* 1194.Ex. 44. *Ans.* 2773820.Ex. 45. *Ans.* 4403241.

SUBTRACTION.

(49, page 30.)

Ex. 6. *Ans.* 353.Ex. 7. *Ans.* 210.Ex. 8. *Ans.* 205.Ex. 9. *Ans.* 320.Ex. 19. *Ans.* 123.Ex. 22. *Ans.* 2113.Ex. 24. *Ans.* 4202.Ex. 25. *Ans.* 11425.Ex. 26. *Ans.* 16348755.Ex. 27. *Ans.* 4014580.

(51, page 32.)

Ex. 3. *Ans.* 721.Ex. 4. *Ans.* 561.Ex. 5. *Ans.* 3769.Ex. 6. *Ans.* 269.

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|--------------------------------|-----------------------------|
| Ex. 7. <i>Ans.</i> 4509. | Ex. 8. <i>Ans.</i> 3449. |
| Ex. 9. <i>Ans.</i> 1288. | Ex. 10. <i>Ans.</i> 30616. |
| Ex. 11. <i>Ans.</i> 21078. | Ex. 12. <i>Ans.</i> 142. |
| Ex. 13. <i>Ans.</i> 762301. | Ex. 19. <i>Ans.</i> 224130. |
| Ex. 20. <i>Ans.</i> 220874. | Ex. 25. <i>Ans.</i> 181972. |
| Ex. 31. <i>Ans.</i> 529509693. | Ex. 34. <i>Ans.</i> 1902001 |

EXAMPLES COMBINING ADDITION AND SUBTRACTION.

(52, page 33.)

- Ex. 1. $2500 + 175 = 2675$
 $5200 - 2675 = 2525$ dollars, *Ans.*
- Ex. 2. $235 + 275 + 325 + 280 = 1115$;
 $1300 - 1115 = 185$ miles, *Ans.*
- Ex. 3. $4234 + 1700 + 962 + 49 = 6945$;
 $8712 - 6945 = 1807$ dollars, *Ans.*
- Ex. 4. $4765 + 750 = 5515$;
 $5515 - 384 = 5131$ dollars, *Ans.*
- Ex. 5. $1224 + 1500 + 1805 = 4529$;
 $7520 - 4529 = 2991$ barrels, *Ans.*
- Ex. 6. $450 + 175 = 625$, B's;
 $450 + 625 = 1075$, A's and B's;
 $1075 - 114 = 961$, C's sheep, *Ans.*
- Ex. 7. $1575 - 807 = 768$, bushels of wheat, }
 $900 - 391 = 509$, " " corn, } *Ans.*
- Ex. 8. $2324 + 1570 + 450 + 175 = 4519$;
 $6784 - 4519 = 2265$ miles, *Ans.*
- Ex. 9. 7375 , first paid;
 $7375 + 7375 = 14750$, second paid;
 $7375 + 14750 = 22125$;
 $35680 - 22125 = 13555$, dollars, *Ans.*

- Ex. 10. $750 + 379 + 450 = 1579$;
 $1579 - 1000 = 579$, dollars, *Ans.*
- Ex. 11. $6709 + 3000 = 9709$;
 $9709 - 4379 = 5330$ dollars, *Ans.*
- Ex. 12. $10026402 + 9526666 = 19553068$, total ;
 $8786968 + 8525565 = 17312533$, native ;
 $19553068 - 17312533 = 2240535$, foreign, *Ans.*
-

MULTIPLICATION.

(61, page 38.)

- Ex. 5. *Ans.* 247368. Ex. 6. *Ans.* 648998.
 Ex. 7. *Ans.* 224744. Ex. 8. *Ans.* 416223.

(64, page 41.)

- Ex. 5. *Ans.* 2508544. Ex. 6. *Ans.* 15731848.
 Ex. 7. *Ans.* 16173942. Ex. 9. *Ans.* 78798.
 Ex. 13. *Ans.* 937456.

CONTRACTIONS.

(67, page 43.)

- Ex. 2. $3472 \times 6 = 20832$; $20832 \times 8 = 166656$, *Ans.*
 Ex. 3. $14761 \times 8 = 118088$; $118088 \times 8 = 944704$, *Ans.*
 Ex. 4. $87034 \times 3 = 261102$; $261102 \times 3 = 783306$;
 $783306 \times 9 = 7049754$, *Ans.*
 Ex. 5. $47326 \times 6 = 283956$; $283956 \times 5 = 1419780$.
 $1419780 \times 4 = 5679120$, *Ans.*

- Ex. 6. $60315 \times 8 \times 3 \times 4 = 5790240$, *Ans.*
 Ex. 7. $291042 \times 5 \times 5 \times 5 = 36380250$, *Ans.*
 Ex. 8. $436 \times 7 \times 8 = 24416$ miles, *Ans.*
 Ex. 9. $124 \times 6 \times 3 \times 4 = 8928$ dollars, *Ans.*
 Ex. 10. $5280 \times 7 \times 3 \times 4 = 443520$ feet, *Ans.*
 Ex. 11. $120 \times 5 \times 5 \times 5 = 15000$ dollars, *Ans.*

(69, page 44.)

- Ex. 3. *Ans.* 13071000. Ex. 4. *Ans.* 890170000.

(70, page 45.)

- Ex. 12.
$$\begin{array}{r} 296 \\ 3000 \\ \hline 888000 \end{array}$$
 dollars, *Ans.*

EXAMPLES COMBINING ADDITION, SUBTRACTION, AND
MULTIPLICATION.

- Ex. 1. $4 \times 45 = 180$; $13 \times 9 = 117$;
 $180 + 117 = 297$ dollars, *Ans.*
 Ex. 2. $31 \times 6 = 186$; $39 \times 6 = 234$;
 $234 - 186 = 48$ dollars, *Ans.*
 Ex. 3. $288 \times 9 = 2592$;
 $2592 - 1875 = 717$ dollars, *Ans.*
 Ex. 4. $240 + 125 + 75 + 50 = 490$;
 $500 - 490 = 10$ dollars, *Ans.*
 Ex. 5. $184 \times 2 = 368$; $67 \times 4 = 268$;
 $368 - 268 = 100$ dollars, *Ans.*
 Ex. 6. $36 \times 320 = 11520$, A received;
 $48 \times 244 = 11712$, B received;
 $11712 - 11520 = 192$ dollars, *Ans.*
 Ex. 7. $35 + 29 = 64$ miles, in one day;
 $64 \times 16 = 1024$ miles, *Ans.*

Ex. 8. $14 \times 26 \times 43 = 15652$ yards, *Ans.*

Ex. 9. $4 \times 365 = 1460$, yearly expenses;
 $3700 - 1460 = 2240$ dollars, *Ans.*

Ex. 10. 2475 , first;
 $2475 - 840 = 1635$, second;
 $2475 + 1635 = 4110$, third;
8220 dollars, *Ans.*

Ex. 11. $336 - (28 \times 10) = 56$ miles, *Ans.*

Ex. 12. $23 \times 14 = 322$, cost of cows;
 $96 \times 7 = 672$, " " horses;
 $57 \times 34 = 1938$, " " oxen;
 $2 \times 300 = 600$, " " sheep;
3532, " " whole.
 $3842 - 3532 = 310$ dollars, *Ans.*

Ex. 13. $36 \times 164 = 5904$
 $3 \times 850 = 2550$
8454 dollars, *Ans.*

Ex. 14. $14760 - (1575 \times 5) = 6885$ dollars, *Ans.*

Ex. 15. $936 \times 9 = 8424$, cost; $480 \times 10 = 4800$
 $456 \times 8 = 3648$
8448
 Flour sells for, 8448
 $8448 - 8424 = 24$ dollars, *Ans.*

DIVISION.

(77, page 50.)

Ex. 2. *Ans.* 16358.

Ex. 3. *Ans.* 17827.

Ex. 4. *Ans.* 20822.

Ex. 5. *Ans.* 672705.

Ex. 6. *Ans.* 182797.

Ex. 7. *Ans.* 829838.

- Ex. 13. *Ans.* $1048795\frac{3}{4}$. Ex. 14. *Ans.* $635926\frac{2}{5}$.
 Ex. 15. *Ans.* $2379839\frac{4}{5}$. Ex. 16. *Ans.* $9355751\frac{1}{5}$.
 Ex. 17. *Ans.* $2456401\frac{1}{2}$. Ex. 18. *Ans.* $7014132\frac{4}{5}$.
 Ex. 19. $47645 \div 5 = 9529$ dollars, *Ans.*
 Ex. 20. $17675 \div 7 = 2525$ weeks, *Ans.*
 Ex. 21. $6756 \div 6 = 1126$ barrels, *Ans.*
 Ex. 22. $46216464 \div 12 = 3851372$ dozen, *Ans.*
 Ex. 23. $347560 \div 5 = 69512$ barrels, *Ans.*
 Ex. 24. $3240622 \div 11 = 294602$ acres, *Ans.*
 Ex. 25. $38470 \div 5 = 7694$ dollars, *Ans.*

(80, page 54.)

- Ex. 5. *Ans.* $212\frac{2}{3}$. Ex. 14. *Ans.* $1489\frac{3}{8}$.
 Ex. 15. *Ans.* $12152\frac{2}{3}$. Ex. 16. *Ans.* $508301\frac{3}{8}$.
 Ex. 17. *Ans.* $12109001\frac{1}{2}\frac{5}{4}$. Ex. 18. *Ans.* $997\frac{7}{8}$.
 Ex. 19. *Ans.* $1343\frac{1}{3}\frac{2}{5}\frac{2}{5}$. Ex. 20. *Ans.* $5473\frac{2}{3}\frac{2}{5}$.
 Ex. 21. *Ans.* $7500\frac{4}{10}\frac{8}{10}\frac{2}{10}$.
 Ex. 27. $1850400 \div 18504 = 100$ dollars, *Ans.*
 Ex. 28. $72320060 \div 10735 = 6736\frac{2}{10}\frac{10}{10}\frac{2}{10}$ dollars, *Ans.*
 Ex. 29. $942321 \div 213 = 4424\frac{2}{3}$ volumes, *Ans.*
 Ex. 30. $5937120 \div 22320 = 266$ dollars, *Ans.*

CONTRACTIONS.

(81, page 56.)

- Ex. 2. $(3690 \div 3) \div 5 = 246$, *Ans.*
 Ex. 3. $(3528 \div 4) \div 6 = 147$, *Ans.*
 Ex. 4. $(7280 \div 5) \div 7 = 208$, *Ans.*
 Ex. 5. $(6228 \div 6) \div 6 = 173$, *Ans.*
 Ex. 6. $(33642 \div 3) \div 9 = 1246$, *Ans.*
 Ex. 7. $(153160 \div 7) \div 8 = 2735$, *Ans.*
 Ex. 8. $[(15625 \div 5) \div 5] \div 5 = 125$, *Ans.*

(82, page 57.)

Ex. 2. $6)34712$

$$\begin{array}{r} 7)5785 \text{ ----- } 2 \\ \hline \end{array}$$

$$826 \text{ --- } 3 \times 6 = 18$$

20, *Ans.*

Ex. 3. $8)401376$

$$\begin{array}{r} 8)50172 \\ \hline \end{array}$$

$$6271 \text{ --- } 4 \times 8 = 32, \text{ } Ans.$$

Ex. 4. $3)139074$

$$\begin{array}{r} 4)46358 \\ \hline \end{array}$$

$$\begin{array}{r} 6)11589 \text{ ----- } 2 \times 3 = 6 \\ \hline \end{array}$$

$$1931 \text{ --- } 3 \times 4 \times 3 = 36$$

42, *Ans.*

Ex. 5. $8)9078126$

$$\begin{array}{r} 5)3026042 \\ \hline \end{array}$$

$$\begin{array}{r} 6)605208 \text{ --- } 2 \times 3 = 6, \text{ } Ans. \\ \hline \end{array}$$

$$100868$$

Ex. 6. $4)18730627$

$$\begin{array}{r} 5)4682656 \text{ ----- } 3 \\ \hline \end{array}$$

$$\begin{array}{r} 6)936531 \text{ ----- } 1 \times 4 = 4 \\ \hline \end{array}$$

$$156088 \text{ --- } 3 \times 5 \times 4 = 60$$

67, *Ans.*

Ex. 7. $2)7360479$

$$\begin{array}{r} 6)3680239 \text{ ----- } 1 \\ \hline \end{array}$$

$$\begin{array}{r} 8)613373 \text{ ----- } 1 \times 2 = 2 \\ \hline \end{array}$$

$$76671 \text{ --- } 5 \times 6 \times 2 = 60$$

63, *Ans.*

Ex. 8. $2)24726300$

$5)12363150$

$7)2472630$

$353232 \dots 6 \times 5 \times 2 = 60, \text{ Ans}$

Ex. 9. $7)5610207$

$2)801458 \dots \dots \dots 1$

$6)400729$

$66788 \dots 1 \times 2 \times 7 = 14$

$15, \text{ Ans.}$

(83, page 58.)

Ex. 2. *Ans.* 476.

Ex. 3. *Ans.* $3620\frac{7}{1000}$.

Ex. 4. *Ans.* $1306\frac{321}{10000}$.

Ex. 5. *Ans.* $976\frac{347}{10000}$.

Ex. 6. *Ans.* $20371\frac{88310}{1000000}$.

(85, page 59.)

Ex. 6. *Ans.* $14556\frac{83178}{1000000}$.

Ex. 7. *Ans.* $10609\frac{3425}{1000000}$.

Ex. 8. *Ans.* $114804\frac{78321}{1000000}$.

Ex. 10. *Ans.* $684\frac{82644319}{1000000000}$.

Ex. 11. $24898 \div 50 = 497\frac{4}{5}$ hours, *Ans.*

Ex. 12. $350000 \div 14000 = 25$ dollars, *Ans.*

EXAMPLES IN THE PRECEDING RULES.

(Page 60.)

Ex. 1. $1732 + 67 = 1799$, *Ans.*

Ex. 2. $1095 \div 365 = 3$ dollars, *Ans.*

Ex. 3. $141 + 47 = 188$ dollars, *Ans.*

Ex. 4. $500 + 17 + 98 + 121 = 736$ acres owned;

$736 - 325 = 411$ acres, *Ans.*

Ex. 5. $2300 - 625 = 1675$ dollars, *Ans.*

- Ex. 6. $60 - 45 = 15$ dollars, saved in one month ;
 $900 \div 15 = 60$ months, *Ans.*
- Ex. 7. $87 \times 9 = 783$ days, *Ans.*
- Ex. 8. 4 first number ;
 $4 \times 8 = 32$ second ;
 $32 \times 9 = 288$ third ;

324, *Ans.*
- Ex. 9. $2 \times 2 \times 7 = 28$;
 $364 \div 28 = 13$, *Ans.*
- Ex. 10. $78 + 104 = 182$;
 $182 \times 2 = 364$ acres, *Ans.*
- Ex. 11. $90 + 30 + 12 + 5 + 7 = 144$;
 $144 \times 27 = 3888$ dollars, *Ans.*
- Ex. 12. $(2250 \times 4) \div 3 = 3000$ dollars, *Ans.*
- Ex. 13. $35 + 40 = 75$ miles in one day ;
 $75 \times 6 = 450$ miles, *Ans.*
- Ex. 14. $40 - 35 = 5$ miles in one day ;
 $5 \times 6 = 30$ miles, *Ans.*
- Ex. 15. $45 - 19 = 26$ years, *Ans.*
- Ex. 16. $1000000000 \div 25000 = 40000$ acres, *Ans.*
- Ex. 17. $384 + 1562 + 25 + 946 = 2917$; $2917 - 2723 = 194$
 $194 \div 97 = 2$; and $2 \times 142 = 284$, *Ans.*
- Ex. 18. $5280 \div 3 = 1760$ steps, *Ans.*
- Ex. 19. $2375 + 340 = 2715$ dollars, cost ;
 $867 + (235 \times 8) = 2747$ " sold for
 $2747 - 2715 = 32$ dollars gain, *Ans.*
- Ex. 20. $4500 - 1350 = 3150$ to gain ;
 $800 - 450 = 350$ yearly savings ;
 $3150 \div 350 = 9$ years, *Ans.*
- Ex. 21. $1600 \times 75 = 120000$;
 $120000 \div 40 = 3000$ bushels, *Ans.*
- Ex. 22. $325 \times 50 \times 2 = 32500$ dollars, *Ans.*

- Ex. 23. $225 - 75 = 150$;
 $150 \times 52 = 7800$ cents, *Ans.*
- Ex. 24. $31383450 \div 4050 = 7749$, *Ans.*
- Ex. 25. $31647000 \div 700 = 45210$ dollars, *Ans.*
- Ex. 26. Reversing fourth operation, $100 - 40 = 60$;
 Reversing third operation, $60 \times 5 = 300$;
 Reversing second operation, $300 \div 3 = 100$;
 Reversing first operation, $100 \times 7 = 700$, *Ans.*
- Ex. 27. $(54 \times 17) \div 27 = 34$ cows, *Ans.*
- Ex. 28. $56 - (2 \times 26) = 4$ dollars, *Ans.*
- Ex. 29. $98 \times 7 = 686$ days, *Ans.*
- Ex. 30. $5301212 \div 11137 = 476$ dollars, *Ans.*
- Ex. 31. $60 - 39 = 21$ gallons, gained hourly ;
 $840 \div 21 = 40$ hours, *Ans.*
- Ex. 32. $4500 \times 24 = 108000$, *Ans.*
- Ex. 33. $1900 - 1492 = 408$ years, *Ans.*
- Ex. 34. Maine, 31766 ;
 New Hampshire, 9280 ;
 Vermont, 10212 ;
 Massachusetts, 7800 ;
 Rhode Island, 1306 ;
 Connecticut, 4674 ;
 $65038 - 47000 = 18038$, *Ans.*
- Ex. 36. $25000 \div 8 = 3125$ pounds in the thread ;
 $3125 + 235 = 3360$ pounds, *Ans.*
- Ex. 37. $8546 + 342 = 8888$;
 $8888 \div 4 = 2222$ dollars, *Ans.*
- Ex. 38. $245 \times 37 = 9065$;
 $9065 + 230 = 9295$, *Ans.*
- Ex. 39. $5190048 \div 72084 = 72$, *Ans.*

- Ex. 40. $109 \times 73 = 7957$, greater number ;
 $28 \times 17 = 476$, difference ;
 $7957 - 476 = 7481$ less, *Ans.*
- Ex. 41. $360 - 114 = 246$, greater ;
 $246 \times 114 = 28044$, *Ans.*
- Ex. 42. $2568754 - 2473248 = 95506$, *Ans.*
- Ex. 43. Wheat, $35 \times 2 = 70$ dollars ;
 Wood, $18 \times 3 = 54$ "
 $\quad\quad\quad 124$ "
 Cloth, $9 \times 4 = 36$ "
 $\quad\quad\quad 88$ dollars, *Ans.*
- Ex. 44. $684 - 375 = 309$ yearly savings ;
 $309 \times 5 = 1545$ dollars, *Ans.*
- Ex. 45. $58 + 10 + 5 + 28 + 3 = 104$, cost of one barrel ;
 $125 - 104 = 21$ cents, *Ans.*
- Ex. 46. $286000 - 6000 = 280000$;
 $280000 \div 14 = 20000$ dollars, *Ans.*
- Ex. 47. $256 \times 25 = 6400$; $6400 - 625 = 5775$;
 $5775 \div 35 = 165$, *Ans.*
- Ex. 48. $189 \div (4 + 5) = 21$ hours, *Ans.*
-

PRIME NUMBERS.

(91, page 68.)

- | | |
|-----------------------------------|--------------------------------------|
| Ex 2. <i>Ans.</i> 2, 2, 3, 5, 19. | Ex. 3. <i>Ans.</i> 3, 3, 5, 5, 7, 19 |
| Ex. 4. <i>Ans.</i> 11, 13, 17. | Ex. 5. <i>Ans.</i> 19, 23, 29. |
| Ex. 6. <i>Ans.</i> 2, 3, 5, 7, 11 | Ex. 7. <i>Ans.</i> 3, 3, 5, 7, 7. |
| Ex. 8. <i>Ans.</i> 11, 31, 41. | |

(92, page 69.)

$$\text{Ex. 2. } 24 = \left\{ \begin{array}{l} 2 \times 12 \\ 3 \times 8 \\ 4 \times 6 \\ 2 \times 3 \times 4 \\ 2 \times 2 \times 6 \\ 2 \times 2 \times 2 \times 3 \end{array} \right. \quad \text{Ex. 3. } 125 = \left\{ \begin{array}{l} 5 \times 25 \\ 5 \times 5 \times 5 \end{array} \right.$$

$$\text{Ex. 4. } 40 = \left\{ \begin{array}{l} 2 \times 20 \\ 4 \times 10 \\ 5 \times 8 \\ 2 \times 2 \times 10 \\ 2 \times 4 \times 5 \\ 2 \times 2 \times 2 \times 5 \end{array} \right.$$

$$\text{Ex. 5 } 72 = \left\{ \begin{array}{l} 2 \times 36 \\ 3 \times 24 \\ 4 \times 18 \\ 6 \times 12 \\ 8 \times 9 \\ 2 \times 2 \times 18 \\ 2 \times 3 \times 12 \\ 2 \times 4 \times 9 \\ 3 \times 4 \times 6 \\ 2 \times 6 \times 6 \\ 3 \times 3 \times 8 \\ 2 \times 2 \times 2 \times 9 \\ 2 \times 2 \times 3 \times 6 \\ 2 \times 3 \times 3 \times 4 \\ 2 \times 2 \times 2 \times 3 \times 3 \end{array} \right.$$

CANCELLA1

(95, page 72.)

$$\begin{array}{r|l} \text{Ex. 3. } 11 & 33 \\ 15 & 35 \\ 14 & 28 \ 14 \\ \hline & 14, \text{ Ans.} \end{array}$$

$$\begin{array}{r|l} \text{Ex. 4. } 14 & 21 \ 3 \\ 13 & 11 \\ & 26 \\ \hline & 33, \text{ Ans.} \end{array}$$

$$\begin{array}{r|l} \text{Ex. 5. } 7 \ 84 & 48 \ 16 \\ 15 & 72 \\ 7 & 28 \ 4 \\ 6 & 5 \\ \hline 7 & 64 \\ \hline & 97, \text{ Ans.} \end{array}$$

$$\begin{array}{r|l} \text{Ex. 6. } 30 & 140 \\ 7 & 30 \\ 26 & 13 \\ 21 & 7 \\ \hline 3 & 13 \\ \hline & 4\frac{1}{3}, \text{ Ans.} \end{array}$$

$$\begin{array}{r|l} \text{Ex. 7. } 22 & 66 \ 3 \\ 6 & 9 \\ 8 \ 40 & 18 \ 3 \\ & 5 \\ \hline 8 & 81 \\ \hline & 10\frac{1}{3}, \text{ Ans.} \end{array}$$

$$\begin{array}{r|l} \text{Ex. 8. } 270 & 200 \\ 40 & 36 \ 2 \\ 15 & 30 \\ 14 & 21 \\ \hline & 2, \text{ Ans.} \end{array}$$

$$\begin{array}{r|l} \text{Ex. 9. } 60 & 240 \ 4 \\ 28 & 56 \ 2 \\ \hline & 8, \text{ Ans.} \end{array}$$

$$\begin{array}{r|l} \text{Ex. 10. } 4 & 18 \ 2 \\ 0 & 6 \\ 3 & 4 \\ 7 & 42 \ 2 \\ 6 & \\ \hline & 4, \text{ Ans.} \end{array}$$

$$\begin{array}{r|l} \text{Ex. 11. } 12 & 30 \ 10 \\ & 4 \\ \hline & 10 \text{ tons, Ans.} \end{array}$$

$$\begin{array}{r|l} \text{Ex. 12. } 56 & 4 \\ 13 & 182 \\ & 6 \\ \hline & 6 \text{ firkins, Ans.} \end{array}$$

$$\begin{array}{r|l} \text{Ex. 13. } 1\cancel{5} & 5 \\ & \cancel{24}^4 \\ & \cancel{3} \\ \hline & 20 \text{ suits, } \textit{Ans.} \end{array}$$

$$\begin{array}{r|l} \text{Ex. 14. } 3\cancel{15} & 115 \\ & \cancel{50}^2 \\ \hline & 3 \\ \hline & 230 \\ \hline & 76\frac{2}{3} \text{ days, } \textit{Ans.} \end{array}$$

GREATEST COMMON DIVISOR.

(98, page 74.)

Ex. 1. $3 \times 4 = 12$, *Ans.*

Ex. 2. $2 \times 3 = 6$, *Ans.*

Ex. 3. $4 \times 6 = 24$, *Ans.*

Ex. 4. $3 \times 6 = 18$, *Ans.*

Ex. 5. $2 \times 7 = 14$, *Ans.*

Ex. 6. $4 \times 4 = 16$, *Ans.*

Ex. 7. $7 \times 10 = 70$, *Ans.*

Ex. 8. $3 \times 5 \times 5 = 75$, *Ans.*

Ex. 9. $2 \times 7 \times 9 = 126$, *Ans.*

Ex. 10. $4 \times 8 = 32$, *Ans.*

Ex. 12. $5 \times 5 = 25$, *Ans.*

(99, page 78.)

Ex. 8. To arrange a number of things in equal parcels, the parcel must be a *divisor* of the number; and to arrange two numbers in equal parcels, the parcel must be a *common divisor* of the two numbers. *Ans.* 5 in a parcel.

Ex. 9. The lots, to be equal, must be a common divisor of the three fields, and to be the greatest possible, must be the greatest common divisor. *Ans.* 2 acres.

Ex. 10. To avoid mixing, the capacity of a bin must be a common divisor of the two numbers of bushels; and to have the least number of bins, will require the *greatest* common divisor of the two numbers of bushels. *Ans.* 21 bushels.

Ex. 11. The greatest common divisor of 124, 116, and 92 rods, the three fronts. *Ans.* 4 rods.

Ex 12. The greatest common divisor of the three lengths, 3013, 2231, and 2047 feet. *Ans.* 23 feet.

Ex. 13. The greatest common divisor of the three numbers of bushels is 2, which must be the capacity of the bag. Now there are to be forwarded $2722 + 1822 + 1226 = 5770$ bushels; and $5770 \div 2 = 2885$. *Ans.* 2885 bags.

Ex. 14. The greatest common divisor of \$120, \$240, and \$384, is \$24, the price of the cows; and $\$120 \div \$24 = 5$, A's number; $\$240 \div \$24 = 10$ B's number; and $\$384 \div \$24 = 16$, C's number.

MULTIPLES.

(104, page 81.)

Ex. 2. $2 \times 5 \times 7 \times 7 = 490$, *Ans.*

Ex. 3. $2 \times 2 \times 2 \times 3 \times 7 \times 17 = 2856$, *Ans.*

Ex. 4. $2 \times 2 \times 2 \times 3 \times 3 = 72$, *Ans.*

Ex. 5. $2 \times 2 \times 2 \times 3 \times 5 \times 7 \times 11 = 9240$, *Ans.*

Ex. 6. $2 \times 3 \times 3 \times 5 \times 5 = 450$, *Ans.*

Ex. 7. $2 \times 2 \times 3 \times 3 \times 5 \times 7 = 1260$, *Ans.*

(105, page 83.)

Ex. 4.
$$\begin{array}{r|l} 2, 3 & 42 \dots 60 \\ 2, 5, 7 & 7 \dots 10 \\ \hline \end{array}$$

 $2 \times 2 \times 3 \times 5 \times 7 = 420$, *Ans.*

Ex. 5.
$$\begin{array}{r|l} 3, 7 & 21 \dots 35 \dots 42 \\ 2, 5 & 5 \dots 2 \\ \hline \end{array}$$

 $3 \times 7 \times 2 \times 5 = 210$, *Ans.*

Ex. 6.
$$\begin{array}{r|l} 2, 5 & 60 \dots 100 \dots 125 \\ 3, 2, 5, 5 & 6 \dots 10 \dots 25 \\ \hline 2 \times 5 \times 3 \times 2 \times 5 \times 5 = 1500, & \text{Ans.} \end{array}$$

Ex. 7.
$$\begin{array}{r|l} 2, 2, 5 & 40 \dots 96 \dots 105 \\ 2, 2, 2, 3 & 2 \dots 24 \dots 21 \\ 7 & 7 \\ \hline 2 \times 2 \times 5 \times 2 \times 2 \times 2 \times 3 \times 7 = 3360, & \text{Ans.} \end{array}$$

Ex. 8.
$$\begin{array}{r|l} 2, 2, 3 & 48 \dots 60 \dots 72 \\ 2, 2, 3, 5 & 4 \dots 5 \dots 6 \\ \hline 2 \times 2 \times 3 \times 2 \times 2 \times 3 \times 5 = 720, & \text{Ans.} \end{array}$$

Ex. 9.
$$\begin{array}{r|l} 2, 2, 3 & 84 \dots 224 \dots 300 \\ 7, 5 & 7 \dots 56 \dots 25 \\ 2, 2, 2, 5 & 8 \dots 5 \\ \hline 2 \times 2 \times 3 \times 7 \times 5 \times 2 \times 2 \times 2 \times 5 = 16800, & \text{Ans.} \end{array}$$

Ex. 10.
$$\begin{array}{r|l} 3, 3 & 270 \dots 189 \dots 297 \dots 243 \\ 3, 3, 7 & 30 \dots 21 \dots 33 \dots 27 \\ 2, 5, 11, 3 & 10 \dots 11 \dots 3 \\ \hline 3 \times 3 \times 3 \times 3 \times 7 \times 2 \times 5 \times 11 \times 3 = 187110, & \text{Ans.} \end{array}$$

Ex. 11.
$$\begin{array}{r|l} 2, 3, 5 & 5 \dots 6 \dots 7 \dots 8 \dots 9 \\ 2, 2, 7, 3 & \dots 7 \dots 4 \dots 3 \\ \hline 2 \times 3 \times 5 \times 2 \times 2 \times 7 \times 3 = 2520, & \text{Ans.} \end{array}$$

Ex. 12. To purchase books at 5 dollars, or 3 dollars, or 4 dollars, or 6 dollars, the sum of money must be some *common multiple* of 5, 3, 4 and 6; and the *least* sum will be the *least common multiple*, which is 60 dollars, *Ans.*

Ex. 13. The least common multiple of 12, 15, and 18 barrels, which is 180 barrels, *Ans.*

Ex. 14. The least common multiple of the prices, \$30, \$55, and \$105, which is \$2310, *Ans.*

Ex. 15. The least common multiple of 41, 63, and 54 sheep, which is 15498 sheep, *Ans.*

Ex. 16. He must spend in the purchase of each kind of fowls a sum equal to the least common multiple of the prices paid. Suppose he takes the cheaper turkeys; the least common multiple of 12, 30, and 75 is 300; and $300 \div 12 = 25$, number of chickens; $300 \div 30 = 10$, number of ducks; $300 \div 75 = 4$, number of turkeys; and $25 + 10 + 4 = 39$, the whole number of fowls purchased. Next suppose he takes the turkeys at the higher price; the least common multiple of 12, 30, and 90 is 180; and $180 \div 12 = 15$, number of chickens; $180 \div 30 = 6$, number of ducks; $180 \div 90 = 2$, number of turkeys; and $15 + 6 + 2 = 23$, whole number of fowls. But $39 - 23 = 16$, number of fowls purchased more than was necessary; and $16 \times 5 = 80$ cents, *Ans.*

FRACTIONS.

(120, page 88.)

Ex. 1. *Ans.* $\frac{7}{8}$.Ex. 2. *Ans.* $\frac{3}{8}$.Ex. 3. *Ans.* $\frac{8}{11}$.Ex. 4. *Ans.* $\frac{1}{3}$.Ex. 5. *Ans.* $\frac{3}{11}$.Ex. 6. *Ans.* $\frac{7}{8}$.Ex. 7. *Ans.* $\frac{2}{4}$.Ex. 8. *Ans.* $\frac{3}{8}$.Ex. 9. *Ans.* $\frac{12}{15}$.Ex. 10. *Ans.* $\frac{9}{12}$.

Ex. 11. Nine tenths; seven twelfths; five twentieths; twelve twenty-eighths; fifteen seventy-fifths; nine one hundred twelfths; forty-five two hundred twentieths; one hundred twenty-five four hundred twentieths.

Ex. 12. Ninety one hundredths; three hundred twenty-five one thousandths; four hundred fifty one thousand two

hundred fortieths ; twenty-five one thousand five hundredths ; twelve two thousandths ; seven hundred twenty-six three thousand four hundred seventy-fifths.

Ex. 13. *Seventeen one hundred fourths ; one ten thousand one hundred tenths ; nine hundred fifteen eighty-four thousand six hundred twenty-firsts ; thirty-eight thousand sixty-five four million five hundred thirty-one thousand four hundred twenty-ninths.*

REDUCTION.

(126, page 90.)

Ex. 5. $\frac{2\frac{2}{3}}{1\frac{1}{2}} = \frac{4}{3}, \text{ Ans.}$

Ex. 6. $\frac{1\frac{1}{2}}{1\frac{1}{3}} = \frac{3}{2}, \text{ Ans.}$

Ex. 7. $\frac{4\frac{2}{3}}{1\frac{1}{2}} = \frac{8}{3}, \text{ Ans.}$

Ex. 8. $\frac{1\frac{1}{2}}{1\frac{1}{3}} = \frac{3}{2}, \text{ Ans.}$

Ex. 12. $\frac{4\frac{1}{2}}{1\frac{1}{2}} = \frac{3}{1}, \text{ Ans.}$

Ex. 13. $\frac{1\frac{2}{3}}{1\frac{1}{2}} = \frac{4}{3}, \text{ Ans.}$

Ex. 14. $\frac{1\frac{2}{3}}{1\frac{1}{2}} = \frac{4}{3}, \text{ Ans.}$

(127, page 91.)

Ex. 4. $\frac{4\frac{1}{2}}{3} = 153\frac{1}{2}, \text{ Ans.}$

Ex. 6. $\frac{1\frac{2}{3}}{2\frac{1}{2}} = 54\frac{1}{2}, \text{ Ans.}$

Ex. 7. $\frac{7\frac{3}{4}}{1\frac{1}{8}} = 41, \text{ Ans.}$

Ex. 9. $\frac{7\frac{3}{4}}{1\frac{1}{8}} = 430\frac{1}{4}, \text{ Ans.}$

(128, page 92.)

Ex. 4. $140 = 2\frac{2}{3}, \text{ Ans.}$

Ex. 6. $94 = 2\frac{2}{3}, \text{ Ans.}$

Ex. 7. $180 = 1\frac{3}{4}, \text{ Ans.}$

Ex. 9. $247 = 2\frac{1}{4}, \text{ Ans.}$

(129.)

Ex. 3. $71\frac{1}{2} = 4\frac{1}{2}, \text{ Ans.}$

Ex. 5. $12\frac{1}{2} = 1\frac{1}{2}, \text{ Ans.}$

Ex. 9. $96\frac{1}{2} = 1\frac{1}{2}, \text{ Ans.}$

Ex. 11. $400\frac{3}{4} = 1\frac{1}{4}, \text{ Ans.}$

(130, page 93.)

Ex. 2. $15 \div 5 = 3$;
 $\frac{3}{1} = \frac{3}{1}$, Ans.

Ex. 3. $35 \div 7 = 5$;
 $\frac{5}{1} = \frac{5}{1}$, Ans.

Ex. 4. $51 \div 17 = 3$;
 $\frac{3}{1} = \frac{3}{1}$, Ans.

Ex. 5. $150 \div 30 = 5$;
 $\frac{5}{1} = \frac{5}{1}$, Ans.

Ex. 6. $3488 \div 436 = 8$;
 $\frac{8}{1} = \frac{8}{1}$, Ans.

Ex. 7. $1000 \div 125 = 8$;
 $\frac{8}{1} = \frac{8}{1}$, Ans.

(132, page 95.)

Ex. 2.
$$\begin{array}{r|l} 5, 5 & 50 \dots 75 \\ 2, 3 & 2 \dots 3 \end{array}$$

 $5 \times 5 \times 2 \times 3 = 150$, least common denominator.
 $\frac{2}{150}, \frac{3}{150}, \frac{4}{150}, \frac{5}{150} = \frac{2}{150}, \frac{3}{150}, \frac{4}{150}, \frac{5}{150}$, Ans.

Ex. 3.
$$\begin{array}{r|l} 2, 2, 2 & 16 \dots 21 \\ 2, 3, 7 & 2 \dots 21 \end{array}$$

 $2 \times 2 \times 2 \times 2 \times 3 \times 7 = 336$, least com. denom.
 $\frac{1}{336}, \frac{4}{336}, \frac{2}{336}, \frac{3}{336} = \frac{1}{336}, \frac{4}{336}, \frac{2}{336}, \frac{3}{336}$, Ans.

Ex. 4.
$$\begin{array}{r|l} 3, 3, 2 & 9 \dots 21 \dots 4 \\ 7, 2 & 7 \dots 2 \end{array}$$

 $3 \times 3 \times 2 \times 7 \times 2 = 252$, least com. denom.
 $\frac{3}{252}, \frac{1}{252}, \frac{2}{252}, \frac{4}{252} = \frac{3}{252}, \frac{1}{252}, \frac{2}{252}, \frac{4}{252}$, Ans.

Ex. 5. $\frac{1}{2}, \frac{2}{3}, \frac{1}{4} = \frac{3}{12}, \frac{8}{12}, \frac{3}{12}$, Ans.

Ex. 7. $\frac{2}{3}, \frac{1}{4}, \frac{3}{5}, \frac{1}{6} = \frac{16}{60}, \frac{5}{60}, \frac{36}{60}, \frac{10}{60}$, Ans.

Ex. 8. $\frac{4}{5}, \frac{7}{8}, \frac{1}{3}, \frac{2}{9} = \frac{32}{72}, \frac{63}{72}, \frac{24}{72}, \frac{16}{72}$, Ans.

Ex. 9. $\frac{2}{3}, \frac{1}{4}, \frac{7}{8}, \frac{1}{11} = \frac{154}{1320}, \frac{330}{1320}, \frac{231}{1320}, \frac{120}{1320}$, Ans.

Ex. 10. $\frac{1}{6}, \frac{2}{7}, \frac{4}{5}, \frac{1}{3}, \frac{5}{11} = \frac{154}{1155}, \frac{330}{1155}, \frac{924}{1155}, \frac{385}{1155}, \frac{515}{1155}$, Ans.

Ex. 11. $\frac{4}{5}, \frac{2}{3}, \frac{1}{6}, \frac{7}{12} = \frac{16}{60}, \frac{40}{60}, \frac{10}{60}, \frac{35}{60}$, Ans.

Ex. 12. $\frac{1}{2}, \frac{3}{4}, \frac{1}{5}, \frac{1}{2} = \frac{10}{20}, \frac{15}{20}, \frac{4}{20}, \frac{10}{20}$, Ans.

Ex. 13. $\frac{1}{3}, \frac{7}{8}, \frac{2}{3}, \frac{1}{5} = \frac{28}{120}, \frac{21}{120}, \frac{80}{120}, \frac{24}{120}, \text{Ans.}$

Ex. 15. $\frac{1}{11}, \frac{1}{2}, \frac{2}{3}, \frac{1}{4} = \frac{6}{132}, \frac{66}{132}, \frac{88}{132}, \frac{33}{132}, \text{Ans.}$

Ex. 16. $\frac{7}{8}, \frac{2}{4}, \frac{9}{8}, \frac{7}{8}, \frac{3}{8}, \frac{1}{2} = \frac{7}{8}, \frac{4}{8}, \frac{9}{8}, \frac{7}{8}, \frac{3}{8}, \frac{14}{8}, \text{Ans.}$

ADDITION.

(133, page 96.)

Ex. 2. $\frac{7+3+1+5+9}{10} = \frac{25}{10} = 2\frac{5}{10} = 2\frac{1}{2}, \text{Ans.}$

Ex. 3. $\frac{4+5+7+1+3+11}{12} = \frac{31}{12} = 2\frac{7}{12}, \text{Ans.}$

Ex. 4. $\frac{7+9+2+13+16+21}{25} = \frac{68}{25} = 2\frac{18}{25}, \text{Ans.}$

Ex. 5. $\frac{41+63+71+89+109}{120} = \frac{373}{120} = 3\frac{13}{120}, \text{Ans.}$

Ex. 6. $\frac{13+76+140+181+223}{225} = \frac{633}{225} = 2\frac{61}{75}, \text{Ans.}$

(134, page 97.)

Ex. 2. $\frac{3}{4} + \frac{2}{9} = \frac{27+8}{36} = \frac{35}{36}, \text{Ans.}$

Ex. 3. $\frac{4}{5} + \frac{11}{14} = \frac{56+55}{70} = \frac{111}{70} = 1\frac{41}{70}, \text{Ans.}$

Ex. 4. $\frac{3}{4} + \frac{1}{8} + \frac{2}{7} + \frac{5}{12} =$
 $\frac{126+21+48+70}{168} = \frac{265}{168} = 1\frac{97}{168}, \text{Ans.}$

$$\text{Ex. 5. } \frac{14}{45} + \frac{9}{13} + \frac{2}{21} =$$

$$\frac{1274 + 2835 + 390}{4095} = \frac{4499}{4095} = 1 \frac{404}{4095}, \text{ Ans.}$$

$$\text{Ex. 6. } \frac{42}{140} + \frac{9}{70} + \frac{7}{28} + \frac{1}{14} =$$

$$\frac{42 + 18 + 35 + 10}{140} = \frac{105}{140} = \frac{3}{4}, \text{ Ans}$$

$$\text{Ex. 7. } \frac{61}{75} + \frac{131}{150} + \frac{24}{25} + \frac{1}{2} + \frac{2}{3} =$$

$$\frac{102 + 131 + 144 + 75 + 100}{150} = 3 \frac{17}{25}, \text{ Ans.}$$

$$\text{Ex. 8. } \frac{3}{4} + \frac{1}{2} + \frac{2}{3} + \frac{4}{5} + \frac{5}{6} + \frac{6}{7} + \frac{7}{8} + \frac{8}{9} + \frac{9}{10} =$$

$$\frac{1890 + 1260 + 1680 + 2016 + 2100 + 2160 + 2205 + 2240 + 2268}{2520}$$

$$= \frac{17819}{2520} = 7 \frac{179}{2520}, \text{ Ans}$$

$$\text{Ex. 10. } \frac{4}{5} + \frac{9}{10} + \frac{2}{3} + \frac{19}{20} = 3 \frac{19}{60}$$

$$\frac{14 + 8 + 1 = 18}{21 \frac{1}{3}}, \text{ Ans.}$$

$$\text{Ex. 11. } \frac{7}{8} + \frac{7}{12} + \frac{4}{6} = 2 \frac{7}{24}$$

$$\frac{1 + 10 + 5 = 16}{18 \frac{7}{24}}, \text{ Ans.}$$

$$\text{Ex. 12. } \frac{3}{4} + \frac{5}{12} + \frac{1}{24} = 1 \frac{5}{24}$$

$$\frac{17 + 18 + 26 = 61}{62 \frac{5}{24}}, \text{ Ans.}$$

$$\text{Ex. 13. } \frac{9}{8} + \frac{11}{6} + \frac{1}{3} + \frac{1}{24} = 1 \frac{1}{4}$$

$$\frac{1 + 3 = 4}{5 \frac{1}{4}}, \text{ Ans.}$$

$$\begin{array}{r} \text{Ex. 14. } \frac{1}{4} + \frac{5}{12} + \frac{1}{4} = 1\frac{5}{12} \\ 125 + 327 + 25 = 477 \\ \hline 478\frac{5}{12}, \text{ Ans.} \end{array}$$

$$\text{Ex. 15. } \frac{148}{120} + \frac{47}{60} + \frac{11}{6} + \frac{11}{60} + \frac{11}{60} = 3\frac{11}{60}, \text{ Ans.}$$

$$\begin{array}{r} \text{Ex. 16. } \frac{9}{70} + \frac{13}{35} + \frac{1}{7} + \frac{1}{10} = \frac{4}{7} \\ 3 + 2 + 40 + 10 = 55 \\ \hline 55\frac{4}{7}, \text{ Ans.} \end{array}$$

$$\begin{array}{r} \text{Ex. 17. } \frac{7}{8} + \frac{3}{4} + \frac{2}{3} = 2\frac{7}{24} \\ 125 + 96 + 48 = 269 \\ \hline 271\frac{7}{24} \text{ yards, Ans.} \end{array}$$

$$\begin{array}{r} \text{Ex. 18. } \frac{1}{5} + \frac{1}{5} + \frac{7}{10} = 1\frac{1}{5} \\ 5 + 3 = 8 \\ \hline 9\frac{1}{5} \text{ yards, Ans.} \end{array}$$

$$\begin{array}{r} \text{Ex. 19. } \frac{7}{12} + \frac{11}{12} + \frac{4}{3} + \frac{3}{4} + \frac{2}{3} = 3\frac{1}{2} \\ 26 + 40 + 51 + 59 + 62 = 238 \\ \hline 241\frac{1}{2} \text{ acres, Ans.} \end{array}$$

$$\begin{array}{r} \text{Ex. 20. } \frac{3}{2} + \frac{4}{3} + \frac{11}{12} + \frac{7}{12} = 2\frac{2}{3} \\ 175 + 325 + 270 + 437 = 1207 \\ \hline 1209\frac{2}{3} \text{ bushels.} \\ \frac{1}{3} + \frac{3}{4} + \frac{11}{12} + \frac{21}{12} = 2\frac{3}{4} \\ 205 + 296 + 200 + 156 = 857 \\ \hline \$859\frac{3}{4}, \text{ dollars.} \end{array}$$

SUBTRACTION.

(135, page 99.)

$$\text{Ex. 2. } \frac{2-5}{9} = \frac{3}{9} = \frac{1}{3}, \text{ Ans.}$$

$$\text{Ex. 3. } \frac{14-11}{12} = \frac{3}{12} = \frac{1}{4}, \text{ Ans.}$$

$$\text{Ex. 4. } \frac{20-6}{27} = \frac{14}{27}, \text{ Ans.}$$

$$\text{Ex. 5. } \frac{49-36}{70} = \frac{13}{70}, \text{ Ans.}$$

$$\text{Ex. 6. } \frac{75-11}{128} = \frac{64}{128} = \frac{1}{2}, \text{ Ans.}$$

$$\text{Ex. 7. } \frac{182-110}{348} = \frac{72}{348} = \frac{6}{29}, \text{ Ans.}$$

(136, page 99.)

$$\text{Ex. 2. } \frac{1}{2} - \frac{2}{9} = \frac{9-4}{18} = \frac{5}{18}, \text{ Ans.}$$

$$\text{Ex. 3. } \frac{15}{24} - \frac{2}{5} = \frac{75-48}{120} = \frac{27}{120} = \frac{9}{40}, \text{ Ans.}$$

$$\text{Ex. 4. } \frac{3}{8} - \frac{4}{17} = \frac{51-32}{136} = \frac{19}{136}, \text{ Ans.}$$

$$\text{Ex. 5. } \frac{84}{120} - \frac{4}{35} = \frac{49-8}{70} = \frac{41}{70}, \text{ Ans.}$$

$$\text{Ex. 6. } \frac{1500}{1728} - \frac{50}{72} = \frac{125-100}{144} = \frac{25}{144}, \text{ Ans.}$$

$$\text{Ex. 7. } \frac{60}{89} - \frac{332}{4272} = \frac{720-83}{1068} = \frac{637}{1068}, \text{ Ans.}$$

$$\begin{aligned} \text{Ex. 9. } 8\frac{1}{2} &= 8\frac{2}{4} \\ 3\frac{7}{8} &= 3\frac{1\frac{1}{2}}{2} \\ &= 4\frac{1\frac{1}{2}}{2}, \text{ Ans.} \end{aligned}$$

$$\begin{aligned} \text{Ex. 10. } 25\frac{4}{5} &= 25\frac{8}{10} \\ 9\frac{7}{10} &= 9\frac{14}{20} \\ 16\frac{4}{5} &= 16\frac{16}{10}, \text{ Ans.} \end{aligned}$$

$$\begin{aligned} \text{Ex. 11. } 4\frac{1}{2} &= 4\frac{1\frac{1}{2}}{2} \\ &= 3\frac{1\frac{1}{2}}{1}, \text{ Ans.} \end{aligned}$$

$$\begin{aligned} \text{Ex. 12. } 6 \\ &= \frac{1\frac{1}{2}}{4\frac{1}{2}}, \text{ Ans.} \end{aligned}$$

$$\begin{aligned} \text{Ex. 13. } 450\frac{1}{2} &= 450\frac{1\frac{1}{2}}{2} \\ 120\frac{3}{4} &= 120\frac{1\frac{1}{2}}{2} \\ &= 330\frac{1\frac{1}{2}}{2}, \text{ Ans.} \end{aligned}$$

$$\begin{aligned} \text{Ex. 14. } 3\frac{1}{2} &= 3\frac{1\frac{1}{2}}{2} \\ 1\frac{1}{2} &= \frac{1\frac{1}{2}}{2} \\ &= 3\frac{1\frac{1}{2}}{2}, \text{ Ans.} \end{aligned}$$

- Ex. 15. $75\frac{1}{4}$
 $\underline{49}$
 $26\frac{1}{4}$, *Ans.*
- Ex. 16. $227\frac{4}{5}$
 $196\frac{2}{3} = 196\frac{4}{6}$
 $\underline{30\frac{4}{6}}$, *Ans.*
- Ex. 19. $\$7\frac{2}{3} - \$6\frac{1}{4} = \$1\frac{5}{12}$, *Ans.*
- Ex. 20. $\frac{7}{8} + 3\frac{1}{2} = 4\frac{7}{4}$
 $5\frac{1}{4} - 4\frac{1}{4} = 1\frac{1}{4}$
 $4\frac{3}{4} - 1\frac{1}{4} = 3\frac{2}{4}$, *Ans.*
- Ex. 21. $6\frac{1}{2} + 2\frac{1}{3} + \frac{2}{3} = 9\frac{2}{3}$
 $\$25\frac{1}{3} - \$9\frac{2}{3} = \$16\frac{1}{3}$, *Ans.*
- Ex. 22. $7\frac{1}{4} - 2\frac{5}{8} = 4\frac{3}{8}$, *Ans.*
- Ex. 23. $\frac{1}{2} - \frac{1}{3} = \frac{1}{6}$, *Ans.*
- Ex. 24. $912\frac{1}{4} + 545\frac{1}{2} = 1457\frac{7}{4}$
 $\$2000 - \$1457\frac{7}{4} = \$542\frac{5}{4}$, *Ans.*
- Ex. 25. $\$136\frac{2}{3} + \$350\frac{2}{3} = \$487\frac{1}{3}$ cost.
 $\$184\frac{1}{2} + \$416\frac{2}{3} = \$601\frac{1}{6}$ receipts.
 $\$601\frac{1}{6} - \$487\frac{1}{3} = \$114\frac{1}{6}$, *Ans.*

MULTIPLICATION.

(137, page 101.)

- Ex. 4. $\frac{3}{11} \times 7 = \frac{21}{11} = 1\frac{10}{11}$, *Ans.*
- Ex. 5. $\frac{9}{14} \times 12 = \frac{108}{14} = 7\frac{5}{7}$, *Ans.*
- Ex. 6. $\frac{5}{21} \times 63 = 5 \times 3 = 15$, *Ans.*
- Ex. 8. $7\frac{3}{5} \times 12 = 84\frac{6}{5} = 91\frac{1}{5}$, *Ans.*
- Ex. 9. $\frac{81}{121} \times 8 = \frac{648}{121} = 5\frac{43}{121}$, *Ans.*
- Ex. 10. $\frac{4}{102} \times 51 = \frac{204}{102} = 2$, *Ans.*
- Ex. 11. $15\frac{5}{8} \times 16 = 125 \times 2 = 250$, *Ans.*
- Ex. 12. $1\frac{9}{12} \times 22 = 18\frac{1}{2} = 16\frac{5}{10}$, *Ans.*
- Ex. 13. $\$8\frac{2}{3} \times 12 = \$104\frac{2}{3} = \$104\frac{4}{6}$, *Ans.*
- Ex. 14. $\$1\frac{1}{2} \times 9 = \$13\frac{1}{2} = \$13\frac{1}{2}$, *Ans.*
- Ex. 15. $\$7\frac{1}{2} \times 27 = \$202\frac{1}{2} = \$202\frac{1}{2}$, *Ans.*

(138, page 103.)

$$\begin{array}{r|l} \text{Ex. 2.} & 3 \\ 9 & 4 \\ \hline 3 & 4 \end{array}$$

 $1\frac{1}{3}$, Ans.

$$\begin{array}{r|l} \text{Ex. 3.} & 100 \\ 14 & 9 \\ \hline 7 & 450 \end{array}$$

 $64\frac{2}{7}$, Ans.

$$\begin{array}{r|l} \text{Ex. 4.} & 105 \\ 21 & 17 \\ \hline \end{array}$$

85, Ans.

$$\begin{array}{r|l} \text{Ex. 5.} & 19 \\ 47 & 13 \\ \hline 47 & 247 \end{array}$$

 $5\frac{1}{4}$, Ans.

$$\begin{array}{r|l} \text{Ex. 7.} & 42 \\ 4 & 39 \\ \hline 2 & 819 \end{array}$$

 $409\frac{1}{2}$, Ans.

$$\begin{array}{r|l} \text{Ex. 8.} & 80 \\ 16 & 233 \\ \hline \end{array}$$

1165, Ans.

$$\begin{array}{r|l} \text{Ex. 9.} & 156 \\ 39 & 27 \\ \hline \end{array}$$

108, Ans.

$$\text{Ex. 10. } \$8 \times \frac{7}{2} = 6\frac{3}{2} \text{ dollars, Ans.}$$

$$\text{Ex. 11. } 36 \times 10\frac{2}{3} = 384 \text{ miles, Ans.}$$

$$\text{Ex. 12. } \$450 \times \frac{7}{2} = \$262\frac{1}{2}, \text{ Ans.}$$

$$\text{Ex. 13. } \$16 \times 2\frac{7}{8} = \$44\frac{1}{2}, \text{ Ans.}$$

(139, page 104.)

$$\begin{array}{r|l} \text{Ex. 2.} & 3 \\ 9 & 4 \\ \hline 3 & 1 \end{array}$$

 $\frac{1}{3}$, Ans.

$$\begin{array}{r|l} \text{Ex. 3.} & 7 \\ 8 & 4 \\ \hline 10 & 7 \end{array}$$

 $\frac{7}{10}$, Ans.

$$\begin{array}{r|l} \text{Ex. 4.} & 11 \\ 24 & 36 \\ \hline 55 & 3 \\ \hline 10 & 3 \end{array}$$

 $\frac{3}{10}$, Ans.

$$\begin{array}{r|l} \text{Ex. 5.} & 21 \\ 5 & 6 \\ \hline 7 & 18 \\ \hline 5 & 18 \end{array}$$

 $3\frac{3}{5}$, Ans.

$$\begin{array}{r} \text{Ex. 6.} \quad 10 \mid 9 \\ \quad 7 \mid 2 \\ \quad 9 \mid 5 \\ \quad 4 \mid 1 \\ \hline 28 \mid 1 \\ \hline \end{array} \quad \frac{1}{\frac{1}{28}}, \text{ Ans.}$$

$$\begin{array}{r} \text{Ex. 7.} \quad 6 \mid 11 \\ \quad 5 \mid 3 \\ \quad \quad 2 \\ \quad 3 \mid 16 \\ \hline 15 \mid 176 \\ \hline \end{array} \quad 11\frac{1}{15}, \text{ Ans.}$$

$$\begin{array}{r} \text{Ex. 9} \quad 15 \mid 8 \\ \quad 4 \mid 9 \\ \quad 5 \mid 1 \\ \quad 3 \mid 22 \\ \hline 25 \mid 44 \\ \hline \end{array} \quad 1\frac{4}{25}, \text{ Ans.}$$

$$\begin{array}{r} \text{Ex. 10.} \quad 7 \mid 2 \\ \quad 1 \mid 16 \\ 10 \mid 7 \\ \quad 3 \mid 80 \\ \hline 3 \mid 256 \\ \hline \end{array} \quad 85\frac{1}{3}, \text{ Ans.}$$

$$\begin{array}{r} \text{Ex. 11.} \quad \quad \mid 3 \\ \quad 2 \mid 1 \\ \quad 7 \mid 4 \\ \quad 5 \mid 4 \\ \quad 4 \mid 13 \\ \hline 35 \mid 78 \\ \hline \end{array} \quad 2\frac{78}{35}, \text{ Ans.}$$

$$\begin{array}{r} \text{Ex. 12.} \quad 2 \mid 5 \\ \quad 4 \mid 3 \\ \quad 5 \mid 4 \\ \quad 3 \mid 4 \\ \hline \end{array} \quad 2, \text{ Ans.}$$

$$\begin{array}{r} \text{Ex. 13.} \quad 8 \mid 7 \\ \quad 2 \mid 1 \\ \quad 9 \mid 11 \\ \quad 2 \mid 3 \\ \quad 1 \mid 8 \\ \hline 12 \mid 77 \\ \hline \end{array} \quad 6\frac{77}{12}, \text{ Ans.}$$

$$\begin{array}{r} \text{Ex. 14.} \quad 2 \mid 25 \\ \quad 2 \mid 11 \\ \quad 4 \mid 27 \\ \hline 16 \mid 7425 \\ \hline \end{array} \quad 464\frac{1}{16}, \text{ Ans.}$$

Ex. 15. $\frac{3}{8} \times \frac{2}{3} = \frac{1}{2}, \text{ Ans.}$

Ex. 16. $\frac{4}{5} \times \frac{3}{4} = \frac{3}{5}, \text{ Ans.}$

Ex. 17. $\frac{2}{3} \times \frac{3}{4} = \frac{1}{2}, \text{ Ans.}$

Ex. 18. $\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}, \text{ Ans.}$

$$\begin{array}{r|l} \text{Ex. 20.} & 51 \\ 4 & 17 \\ \hline 8 & 867 \end{array}$$

Ans., 108 $\frac{3}{4}$.

$$\begin{array}{r|l} \text{Ex. 21.} & 51 \\ 8 & 14 \\ \hline 20 & 357 \end{array}$$

Ans., 17 $\frac{1}{2}$ dollars.

Ex. 22. $\frac{3}{4} \times \frac{1}{2} \times \$1\frac{1}{10} = \$21\frac{3}{10}$, *Ans.*

Ex. 23. $\frac{9}{8} \times \$1\frac{1}{2} = \$22\frac{1}{4}$, *Ans.*

Ex. 24. $\frac{1}{2} \times \frac{1}{2} \times \frac{2}{3} \times \$2\frac{1}{2} = \$25\frac{1}{5}$, *Ans.*

Ex. 25. $\frac{7}{8} \times \frac{2}{3} = \frac{1}{2}\frac{1}{4}$, *Ans.*

Ex. 26. $\$4\frac{3}{4} \times \frac{1}{2} = \$25\frac{3}{8}$, *Ans.*

Ex. 27. $7\frac{1}{2}$ acres $\times \frac{2}{3} \times \frac{2}{3} = 49\frac{2}{3}$ acres, *Ans.*

Ex. 28. $4\frac{3}{8} \times \frac{1}{4}$ barrels $= 6\frac{1}{8}$ barrels, *Ans.*

DIVISION.

(140, page 107.)

Ex. 6. $\frac{7}{25} \div 25 = \frac{1}{25}$, *Ans.*

Ex. 9. $\$2 \div 6 = \$\frac{1}{3}$, *Ans.*

Ex. 10. $\frac{1}{7} \div 7 = \frac{1}{49}$, *Ans.*

Ex. 11. $\frac{4}{5} \div 5 = \frac{4}{25}$, *Ans.*

Ex. 12. $\$2\frac{1}{2} \div 9 = \$\frac{5}{18}$, *Ans.*

Ex. 14. $\frac{2}{3} \div 3 = 5\frac{7}{9}$, *Ans.*

Ex. 15. $\frac{3}{4} \times \frac{1}{2} \div 9 = \frac{1}{12}$, *Ans.*

Ex. 16. $\$24\frac{2}{3} \div 4 = \$6\frac{1}{3} = \$24\frac{2}{3}$, *Ans.*

(141, page 109.)

Ex. 7. $\frac{3}{5} \times 9 \div \frac{1}{2} = 15$, *Ans.*

Ex. 8. $\$21 \div \frac{3}{4} = \49 , *Ans.*

Ex. 9. $16 \times \frac{5}{8} = 10$; $10 \div \frac{1}{2} = 22\frac{1}{2}$, *Ans.*

Ex. 11. $75 \div \frac{5}{8} = 5\frac{1}{2}$, *Ans.*

Ex. 12. $149 \div \frac{1}{6} = 6\frac{3}{4}$, *Ans.*

Ex. 13. $15 \div \frac{5}{3} = 9$, *Ans.*

Ex. 14. $\frac{2}{3} \times 320 = 200$; $\frac{2}{3} \times \frac{2}{3} = \frac{2}{9}$;
 $200 \div \frac{2}{9} = 25\frac{2}{3}$, *Ans.*

Ex. 15. $\$32 \times \frac{1}{4} = 8$; $\frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$;
 $\$8 \div \frac{1}{6} = \$3\frac{1}{3}$, *Ans.*

Ex. 16. $183 \div \frac{1}{4} = 4$, *Ans.*

(142, page 110.)

Ex. 2.
$$\begin{array}{r|l} 8 & 7 \\ 3 & 4 \\ \hline 6 & 7 \end{array}$$

 $1\frac{1}{3}$, *Ans.*

Ex. 3.
$$\begin{array}{r|l} 9 & 5 \\ 1 & 6 \\ \hline 8 & 10 \end{array}$$

 $3\frac{1}{3}$, *Ans.*

Ex. 4.
$$\begin{array}{r|l} 7 & 4 \\ 9 & 10 \\ \hline 63 & 40 \end{array}$$

 $\frac{4}{3}$, *Ans.*

Ex. 5.
$$\begin{array}{r|l} 2 & 1 \\ 7 & 13 \\ \hline 14 & 13 \end{array}$$

 $\frac{1}{3}$, *Ans.*

Ex. 6.
$$\begin{array}{r|l} 3 & 2 \\ 27 & 28 \\ \hline 81 & 56 \end{array}$$

 $\frac{5}{3}$, *Ans.*

Ex. 7.
$$\begin{array}{r|l} 6 & 5 \\ 4 & 5 \\ \hline 24 & 25 \end{array}$$

 $1\frac{1}{4}$, *Ans.*

Ex. 8.
$$\begin{array}{r|l} 3 & 5 \\ 3 & 7 \\ \hline 9 & 35 \end{array}$$

 $3\frac{2}{3}$, *Ans.*

Ex. 9.
$$\begin{array}{r|l} 19 & 17 \\ 7 & 19 \\ \hline 7 & 17 \end{array}$$

 $2\frac{2}{3}$, *Ans.*

Ex. 10.
$$\begin{array}{r|l} 20 & 13 \\ 5 & 16 \\ \hline 25 & 52 \end{array}$$

 $2\frac{2}{5}$, *Ans.*

Ex. 11.
$$\begin{array}{r|l} 7 & 2 \\ 2 & 5 \\ 1 & 2 \\ 3 & 4 \\ \hline 21 & 40 \end{array}$$

 $1\frac{1}{3}$, *Ans.*

$$\begin{array}{r|l} \text{Ex. 12.} & 10 \quad 9 \\ & 4 \\ & 5 \quad 6 \\ & 13 \quad 4 \\ \hline & 325 \quad 432 \\ \hline & 11\frac{97}{325}, \text{ Ans.} \end{array}$$

$$\text{Ex. 15.} \quad \frac{6\frac{2}{3}}{8\frac{2}{3}} = \frac{56}{9} \times \frac{3}{26} = \frac{28}{39}, \text{ Ans.}$$

$$\text{Ex. 16.} \quad \frac{11\frac{3}{4}}{\frac{7}{4}} = \frac{80}{7} \times \frac{7}{4} = 20, \text{ Ans.}$$

$$\text{Ex. 17.} \quad \frac{\frac{5}{11}}{4\frac{2}{3}} = \frac{5}{11} \times \frac{5}{22} = \frac{25}{242}, \text{ Ans.}$$

$$\text{Ex. 18.} \quad \frac{\frac{2}{3} \times \frac{3}{4}}{\frac{1}{2}} = \frac{2}{3} \times \frac{3}{4} \times \frac{2}{1} = 1, \text{ Ans.}$$

$$\text{Ex. 19.} \quad \frac{\frac{2}{3} \times \frac{5}{6}}{\frac{2}{3} \times \frac{2}{3}} = \frac{2}{5} \times \frac{5}{6} \times \frac{9}{2} \times \frac{2}{9} = \frac{1}{3}, \text{ Ans.}$$

$$\text{Ex. 20.} \quad 2\frac{1}{4} \times \frac{2}{3} = 14, \text{ Ans.}$$

$$\text{Ex. 21.} \quad 2\frac{2}{3} \times \frac{5}{6} = 2\frac{2}{3} = 6\frac{2}{3}, \text{ Ans.}$$

$$\begin{array}{r|l} \text{Ex. 22.} & 8 \quad 35 \\ & 1 \quad 2 \\ & 5 \quad 6 \\ \hline & 2 \quad 21 \\ \hline & 10\frac{1}{2}, \text{ Ans.} \end{array}$$

$$\begin{array}{r|l} \text{Ex. 23.} & 3 \quad 98 \\ & 14 \quad 5 \\ \hline & 3 \quad 35 \\ \hline & 11\frac{1}{2}, \text{ Ans.} \end{array}$$

$$\begin{aligned} \text{Ex. 24.} \quad & \$1\frac{3}{4} \times \frac{1}{2} \times \frac{2}{3} = \$14\frac{1}{2}; \\ & \$17 - \$14\frac{1}{2} = \$2\frac{1}{2}, \text{ Ans.} \end{aligned}$$

$$\begin{array}{r|l} \text{Ex. 25} & 10 \quad 3 \\ & 2 \quad 3 \\ \hline & 20 \quad 9 \\ \hline & \$\frac{1}{2}, \text{ Ans.} \end{array}$$

Ex. 26.

$$\begin{array}{r|l} 10 & \\ 8 & 2 \\ 10 & 3 \\ \hline & 2 \text{ bu., Ans.} \end{array}$$

Ex. 27.

$$\begin{array}{r|l} 16 & 1905 \\ 75 & 8 \\ \hline 10 & 127 \\ \hline & 12\frac{7}{10}, \text{ Ans} \end{array}$$

PROMISCUOUS EXAMPLES.

(Page 112.)

Ex. 2. $91 \div 7 = 13$; $\frac{4}{5} \times \frac{13}{5} = \frac{52}{25}$, Ans.

Ex. 3. $3, 40 \mid 3 :: 40$
 $3 \times 40 = 120$, Ans.

Ex. 4. $4 + 3 = 7$
 $\frac{1}{3} + \frac{7}{6} + \frac{1}{2}$ of $\frac{2}{3} = 2\frac{11}{6}$
 $9\frac{11}{6}$, Ans.

Ex. 5. $\frac{2}{3} \times \frac{17}{6} = \frac{17}{9} = 4\frac{7}{9}$
 $\frac{4}{5} \times \frac{17}{5} = \frac{68}{25} = 2\frac{14}{25}$
 $1\frac{22}{25}$, Ans.

Ex. 6. $4756\frac{1}{5} + 128\frac{3}{4} = 4885\frac{7}{20}$, Ans.

Ex. 7. $\frac{7}{8} \times \frac{7}{8} \times \frac{2}{3} \times \frac{2}{3} = \frac{49}{18} = 7\frac{7}{18}$
 $\frac{21}{8} \times \frac{2}{3} \times \frac{1}{4} \times \frac{2}{3} = \frac{7}{18} = 4\frac{2}{18}$
 $3\frac{17}{18}$, Ans.

Ex. 8. $4 \times 4 = 20$, Ans.; $\frac{4}{5} \times \frac{3}{4} = \frac{3}{5} = 1\frac{1}{5}$, Ans.

Ex. 9. $1825\frac{7}{8} = 1460\frac{7}{8}$; $1460\frac{7}{8} \times \frac{2}{3} = 2443\frac{1}{3}$, Ans.

Ex. 10. $\frac{1}{2} + \frac{1}{4} = \frac{3}{4}$; $1 - \frac{3}{4} = \frac{1}{4}$; $77 \div \frac{1}{4} = 140$, Ans.

Ex. 11. $\frac{1}{3} \times \$1\frac{1}{2} \times \frac{3}{4} = \$24\frac{1}{4}$, Ans.

Ex. 12. $\$4\frac{7}{8} \times \frac{1}{4} = \$23\frac{1}{2}$, Ans.

$$\begin{array}{r|l} \text{Ex. 13.} & 8 \mid 14701 \\ 14701 & 2 \\ \hline 4 & 1 \\ \hline \end{array}$$

$\$1, \text{Ans.}$

$$\begin{array}{r|l} \text{Ex. 14.} & 8 \mid 37803 \\ 471 & 2 \\ \hline & 628 \\ \hline \end{array}$$

$\$12601, \text{Ans.}$

Ex. 15. $\$2\frac{1}{4} \times \frac{2}{1} \times \frac{1}{2} = \$4055\frac{1}{2}, \text{Ans.}$

Ex. 16. $\frac{\frac{1}{2} \times 8\frac{2}{3}}{14\frac{7}{10}} = \frac{1}{2} \times \frac{42}{5} \times \frac{10}{147} = \frac{2}{7}; 14\frac{2}{7} - \frac{2}{7} = 14$
 $\frac{1}{4} \times \frac{2}{3} \times \frac{3}{4} = 27, \text{Ans.}$

Ex. 17. $\frac{1}{4} \times \frac{1}{4} \times \frac{2}{3} = \frac{1}{12} = 24\frac{7}{10}, \text{Ans.}$

Ex. 18. $\frac{1}{2} \times \frac{1}{4} \times \frac{1}{3} = 34\frac{1}{6}, \text{Ans.}$

Ex. 19. $\frac{7}{8} \times \frac{2}{3} = \frac{7}{12} = 7\frac{7}{12}, \text{Ans.}$

Ex. 20. $\frac{5}{8} - \frac{9}{20} = \frac{7}{40}, \text{Ans.}$

Ex. 21. $\frac{2}{3} + \frac{7}{9} = \frac{7}{3}, \text{Ans.}$

Ex. 22. $\frac{1}{3} \times \frac{1}{11} \times \frac{131}{12} = \frac{1171}{12} = 589\frac{1}{2}, \text{Ans.}$

Ex. 23. $\frac{224}{1} \times \frac{5}{1200} \times \frac{2000}{1} = 2500, \text{Ans.}$

Ex. 24. $\frac{1}{4} + \frac{1}{5} + \frac{1}{10} + \frac{1}{20} = \frac{3}{4}; 1 - \frac{3}{4} = \frac{1}{4}$
 $\$20 \div \frac{1}{4} = \$50, \text{Ans.}$

Ex. 25. $\frac{3}{4} - \frac{3}{8} = \frac{3}{8}; 1 - \frac{3}{8} = \frac{5}{8}; 34 \div \frac{5}{8} = 40, \text{Ans.}$

Ex. 26. $\$17\frac{1}{2} \times \frac{2}{5} = \$4608, \text{Ans.}$

$$\begin{array}{rcl} \text{Ex. 27.} & 320 \times \$2\frac{1}{4} = \$ & 720 & 755 \times \frac{2}{3} \times \$1\frac{1}{2} = 528\frac{1}{2} \\ & 435 \times \$17\frac{1}{8} = \$ & 815\frac{1}{8} & 755 \times \frac{2}{3} \times \$2\frac{1}{8} = 962\frac{1}{8} \\ & \underline{755} & \underline{\$1535\frac{1}{8}} & \underline{\$1491\frac{1}{8}} \\ & & \$1535\frac{1}{8} - \$1491\frac{1}{8} = \$44\frac{1}{2}, \text{Ans.} \end{array}$$

Ex. 28. $\frac{7+5}{8+5} = \frac{12}{13}; \frac{12}{13} - \frac{7}{8} = \frac{5}{104}, \text{Ans.}$

Ex. 29. $\frac{8+5}{7+5} = \frac{13}{12}; \frac{8}{7} - \frac{13}{12} = \frac{5}{84}, \text{Ans.}$

Ex. 30. $\frac{2}{3} \times \frac{1}{2} \times \frac{1}{4} \times \frac{3}{2} = 7\frac{1}{2}, \text{Ans.}$

Ex. 31. $\frac{1}{4} \times \$3\frac{1}{2} \times \frac{2}{3} \times \frac{2}{3} = \frac{1}{2} = \$3\frac{1}{2}, \text{Ans.}$

$$\text{Ex. 32. } 16\frac{3}{4} - 3\frac{7}{8} = 12\frac{1}{2} = 2\frac{1}{2}$$

$$1\frac{1}{2} \times 1\frac{2}{3} \times \frac{2}{3} = 2\frac{2}{3} = 953\frac{1}{3}, \text{ Ans.}$$

$$\text{Ex. 33. } 7\frac{3}{4} \times 1\frac{1}{2} = 11\frac{3}{4} = 12\frac{3}{4}, \text{ Ans.}$$

$$\text{Ex. 34. } 6 \div 1846 = \frac{3}{923}, \text{ Ans.}$$

$$\text{Ex. 35. } 3\frac{2}{3} \times \frac{7}{4} \times \frac{3}{8} = 3, \text{ Ans.}$$

$$\text{Ex. 36. } 3\frac{1}{3} \times \frac{5}{2} \times \frac{1}{4} \times \frac{3}{4} \times \frac{1}{2} = 3, \text{ Ans.}$$

$$\text{Ex. 37. } \frac{3}{4} + \frac{1}{10} = \frac{17}{20}; 1 - \frac{17}{20} = \frac{3}{20}; \frac{3}{20} - \frac{1}{4} = \frac{1}{20}$$

$$20 \div \frac{1}{20} = 400, \text{ Ans.}$$

$$\text{Ex. 38. } 1\frac{2}{3} \text{ cents} \times \frac{2}{3} \times \frac{4}{4} = 100 \text{ cents, Ans.}$$

$$\text{Ex. 39. } \frac{1}{2} + \frac{3}{4} = \frac{5}{4}; 1 - \frac{5}{4} = \frac{3}{4}, \text{ remainder.}$$

$$1\frac{1}{2} \times \frac{7}{4} \times 3\frac{2}{3} = 10\frac{1}{2} = 4577\frac{3}{4}, \text{ Ans.}$$

Ex. 40. If the horse cost $1\frac{1}{4}$ times as much as the wagon, the horse and wagon must cost $2\frac{1}{4}$ times the wagon. Hence,

$$\$270 \div 2\frac{1}{4} = \$120, \text{ Ans.}$$

$$\text{Ex. 41. } \frac{2}{5} \times \frac{4}{2} = 32; 32 - 20\frac{3}{4} = 11\frac{1}{4}, \text{ Ans.}$$

$$\text{Ex. 42. } 3\frac{1}{2} \times \frac{1}{2} \times 3\frac{1}{2} = 126, \text{ Ans.}$$

Ex. 43. If A can do $\frac{3}{4}$ as much as B, he can do the work in $\frac{4}{3}$ of the time that B will require, and in $1 + \frac{4}{3} = \frac{7}{3}$ of the time both will require. Hence

$$\left. \begin{array}{l} 14 \text{ days} \times \frac{7}{3} = 32\frac{2}{3} \text{ days, A's time;} \\ 32\frac{2}{3} \text{ days} \times \frac{3}{4} = 24\frac{1}{2} \text{ days, B's time;} \end{array} \right\} \text{ Ans.}$$

$$\text{Ex. 44. } 1\frac{1}{2} \times \frac{3}{4} \times \frac{4}{4} = 11\frac{1}{4}, \text{ Ans.}$$

Ex. 45. A, B, and C can do $\frac{1}{2}$ of the work in a day;
 B and C can do $\frac{1}{3}$ of the work in a day; hence
 A alone can do $\frac{1}{2} - \frac{1}{3} = \frac{1}{6}$ of it in a day; and
 he will therefore require $1\frac{1}{2} = 1\frac{1}{2}$ days, Ans.

$$\text{Ex. 46. } \frac{2}{3} + \frac{1}{3} + \frac{1}{3} = 1\frac{1}{3}; 1 - 1\frac{1}{3} = \frac{2}{3}, \text{ remainder;}$$

$$\frac{2}{3} - \frac{1}{3} = \frac{1}{3}; \$24 \div \frac{1}{3} = \$720, \text{ Ans.}$$

$$\text{Ex. 47. } 1\frac{1}{2} \times \frac{1}{2} \times \frac{2}{2} = 4\frac{1}{2}, \text{ Ans.}$$

Ex. 48. $\frac{7}{8} \times \frac{1}{2} \times \frac{12}{10} \times \frac{4}{5} \times \frac{2}{3} \times \frac{1}{2} = 9\frac{1}{2}$, *Ans.*

Ex. 49. $\frac{1}{2} - \frac{1}{8} = \frac{3}{8}$; 30 feet $\div \frac{3}{8} = 100$ feet, *Ans.*

Ex. 50. $\$1\frac{1}{2} \times \frac{4}{5} \times \frac{7}{8} = \$57\frac{1}{2}$, *Ans.*

Ex. 51. $\frac{1}{8} + \frac{1}{4} = \frac{3}{8}$, fraction of the post *below* water,
 $1 - \frac{3}{8} = \frac{5}{8}$ " " " *above* "
 $21 \div \frac{5}{8} = 36$ feet, *Ans.*

Ex. 52. $\frac{3}{4} =$ eldest son's fraction;
 $\frac{4}{5} \times \frac{4}{5} = \frac{16}{25} =$ youngest son's fraction;
 $1 - (\frac{3}{4} + \frac{16}{25}) = \frac{1}{100} =$ daughter's fraction;
 $\frac{1}{100} - \frac{1}{100} = \frac{0}{100}$; $\$1723\frac{4}{5} \div \frac{4}{5} = \$2114\frac{1}{5}$, *Ans.*

DECIMAL FRACTIONS.

(145, page 118.)

Ex. 1. *Ans.* .38.

Ex. 2. *Ans.* 1.

Ex. 3. *Ans.* .325.

Ex. 4. *Ans.* 04.

Ex. 5. *Ans.* .016.

Ex. 6. *Ans.* .00074.

Ex. 7. *Ans.* .000745.

Ex. 8. *Ans.* .4232.

Ex. 9. *Ans.* .500000.

Ex. 10. Five hundredths; twenty-four hundredths; six hundred seventy-two thousandths; six hundred eighty-one thousandths; twenty-four thousandths; eight thousand four and seventy-one ten-thousandths; nine thousand thirty-four ten-thousandths; five ten-thousands; one hundred thousand two hundred forty-eight millionths; nineteen thousand two hundred forty-eight hundred-thousandths; one thousand three hundred eighty-five millionths; one million eighty-seven ten-millionths.

(146, page 118.)

Ex. 1. *Ans.* 18.027. Ex. 2. *Ans.* 400.0000019.

Ex. 3. *Ans.* 54.000054. Ex. 4. *Ans.* 81.0001.

Ex. 5. *Ans.* 100.0067.

Ex. 6. Eighteen, and twenty-seven thousandths; eighty-one, and one ten-thousandth; seventy-five, and seventy-five thousandths; one hundred, and sixty-seven ten-thousandths; fifty-four, and fifty-four millionths; nine, and two thousand eight hundred six ten-thousandths; four hundred, and nineteen ten-millionths; three, and three hundredths; forty, and forty thousand four hundred four hundred-thousandths.

(148, page 120.)

Ex. 1. *Ans.* .000425.

Ex. 2. *Ans.* .6000.

Ex. 3. *Ans.* .01859.

Ex. 4. *Ans.* .000260008.

Ex. 5. Six thousand three hundred twenty-one ten thousandths; five million four hundred thousand twenty-seven ten-millionths; seven hundred forty-eight thousand two hundred forty-three millionths; sixty million hundred-millionths; two million nine hundred sixty-two thousand nine hundred ninety-nine ten-millionths; six hundred-millionths.

Ex. 6. *Ans.* 502.001006.

Ex. 7. *Ans.* 31.0000002

Ex. 8. *Ans.* 11000.00011.

Ex. 9. *Ans.* 9000000.000000009.

Ex. 10. *Ans.* 10.2.

Ex. 11. *Ans.* 124.315.

Ex. 12. *Ans.* .700.

Ex. 13. *Ans.* .00007.

Ex. 14. Twelve, and thirty-six hundredths; one hundred forty-two, and eight hundred forty-seven thousandths; one, and two hundredths; nine, and fifty-two thousandths; thirty-two, and four thousandths; four, and five ten-thousandths; sixty-two and nine thousand nine hundred ninety-nine ten-thousandths; one thousand eight hundred fifty-eight, and four

thousand five hundred eighty-three ten-thousandths; twenty seven, and forty-five hundred-thousandths.

REDUCTION.

(149, page 121.)

Ex. 2.	.1700000	Ex. 3.	.700000
	24.6000000		.024000
	.0003000		.000187
	84.0000000		.000500
	721.8000271		108.450000
Ex. 4.	1000.001000		
	841.780000		
	2.600400		
	90.000009		
	6000.000000		

(150, page 122.)

Ex. 2.	$\frac{125}{1000} = \frac{1}{8}$, Ans.	Ex. 3.	$\frac{16}{100} = \frac{4}{25}$, Ans.
Ex. 4.	$\frac{655}{1000} = \frac{131}{200}$, Ans.	Ex. 5.	$\frac{9375}{10000} = \frac{15}{16}$, Ans.
Ex. 6.	$\frac{3}{10000} = \frac{1}{2500}$, Ans.		

(151, page 123.)

Ex. 4.	Ans. .4.	Ex. 6.	Ans. .875.
Ex. 9.	Ans. .375.	Ex. 10.	Ans. .0375.

ADDITION.

(152, page 124.)

Ex. 6.	26.26	Ex. 7.	36.015
	.7		300.0605
	6.083		5.000003
	4.004		60.0000087
	<hr/>		<hr/>
	37 047, Ans.		401.0755117, Ans.

Ex. 8. 54.34
 1.0009
 3.000207
 .023
 8.9
 4.135

 71.399107, *Ans.*

Ex. 9. 18.375
 41.625
 35.5

 95.500, *Ans.*

Ex. 10 61.843
 143.75
 218.4375
 21.9

 445.9305, *Ans.*

Ex. 11. $12\frac{3}{4} = 12.75$
 $18\frac{2}{5} = 18.4$
 $9 = 9$
 $24\frac{1}{8} = 24.125$
 $4\frac{1}{6} = 4.8125$
 $8\frac{9}{10} = 8.9$
 $15\frac{1}{2} = 15.65$

 93.6375, *Ans.*

Ex. 12. $2\frac{1}{2} = 2.5$
 $5\frac{3}{4} = 5.75$
 $3\frac{5}{8} = 3.625$
 3.0642
 8.925

 23.8642 barrels, *Ans.*

	Broadcloth.	Cassimere.	Satin.
Ex. 13. First suit,	2.125	3.0625	.875
Second "	2.25	2.875	1.000
Third "	5.0625		1.125
Sums	9.4375	5.9375	3.000
Total	$9.4375 + 5.9375 + 3 = 18.375$, <i>Ans.</i>		

SUBTRACTION.

(153, page 126.)

$$\begin{array}{r} \text{Ex. 4. } 714.000 \\ \quad .916 \\ \hline 713.084, \text{ Ans.} \end{array}$$

$$\begin{array}{r} \text{Ex. 5. } 2.000 \\ \quad .298 \\ \hline 1.702, \text{ Ans.} \end{array}$$

$$\begin{array}{r} \text{Ex. 6. } 21.004 \\ \quad .75 \\ \hline 20.254, \text{ Ans.} \end{array}$$

$$\begin{array}{r} \text{Ex. 7. } 10.0302 \\ \quad .0002 \\ \hline 10.03, \text{ Ans} \end{array}$$

$$\begin{array}{r} \text{Ex. 8. } 900. \\ \quad .009 \\ \hline 899.991, \text{ Ans.} \end{array}$$

$$\begin{array}{r} \text{Ex. 9. } 2000. \\ \quad .002 \\ \hline 1999.998, \text{ Ans.} \end{array}$$

$$\begin{array}{r} \text{Ex. 10. } 1. \\ \quad .000001 \\ \hline .999999, \text{ Ans.} \end{array}$$

$$\begin{array}{r} \text{Ex. 11. } .427 \\ \quad .000427 \\ \hline .426573, \text{ Ans.} \end{array}$$

$$\begin{array}{r} \text{Ex. 12. } .34 \\ \quad .034 \\ \hline .306, \text{ Ans.} \end{array}$$

MULTIPLICATION.

(154, page 127.)

$$\text{Ex. 4. } 274.855, \text{ Ans.}$$

$$\text{Ex. 8. } 243.5, \text{ Ans.}$$

$$\text{Ex. 12. } .000030624, \text{ Ans.}$$

DIVISION.

(155, page 129.)

Ex. 5. .111, *Ans.*Ex. 6. 11.1, *Ans.*Ex. 8. 15.27+, *Ans.*Ex. 9. 1; 10; 100; 1000, *Ans.*Ex. 10. 5.6814+, *Ans.*Ex. 12. 3020, *Ans.*Ex. 17. 3.65, *Ans.*

PROMISCUOUS EXAMPLES.

(Page 130.)

Ex. 2. 6188.311478, *Ans.* Ex. 3. 86.913, *Ans.*Ex. 6. .00012, *Ans.*Ex. 9. 4, *Ans.*Ex. 11. $70.6755 \div 6.35 = 11.13$, *Ans.*Ex. 12. $\frac{22.5}{1.666} = \frac{5}{8}$, *Ans.*Ex. 13. $26\frac{27.5}{1.666} = 26\frac{1}{2}$, *Ans.*Ex. 15. $\frac{8\frac{3}{4}}{17\frac{1}{2}} = \frac{8.75}{17.5} = .5$, *Ans.*Ex. 16. $\frac{.25 \times 17.5}{.5 \times 1.75} = 5$, *Ans.*Ex. 17. $3.625 \times 36.75 \times \$.85 = \$113.2359375$, *Ans.*Ex. 18. $56.925 \div 4.6 = 12.375 = 12\frac{3}{8}$, *Ans.*

DECIMAL CURRENCY.

NOTATION AND NUMERATION.

(160, page 132.)

Ex. 2. *Ans.* \$2.09.Ex. 3. *Ans.* \$10.10.Ex. 6. *Ans.* \$.032.Ex. 7. *Ans.* \$100.011

Ex. 8. Seven dollars ninety-three cents; eight dollars two cents; six dollars fifty-four cents two mills.

Ex. 9. Five dollars twenty-seven cents two mills; one hundred dollars two cents five mills; seventeen dollars five mills.

Ex. 10. Sixteen dollars twenty cents five mills; two hundred fifteen dollars eight cents one mill; one thousand dollars one cent one mill; four dollars two mills.

REDUCTION.

(161, page 133.)

Ex. 2. *Ans.* 3600 cents.Ex. 3. *Ans.* 524800 cents.Ex. 6. *Ans.* 160 mills.Ex. 7. *Ans.* 3008 mills.Ex. 8. *Ans.* 890 mills.

(162, page 134.)

Ex. 2. *Ans.* \$15.04.Ex. 3. *Ans.* \$138.75.Ex. 4. *Ans.* \$16.525.Ex. 5. *Ans.* 52.4 cents.Ex. 6. *Ans.* \$6.524.

ADDITION.

(163, page 134.)

Ex. 2. \$ 50.07

Ex. 3. \$ 364.541

1000.75

486.06

60.003

93.009

.184

1742.80

1.01

3.276

25.458

\$2689.686, *Ans.*\$1137.475, *Ans.*

ADDITION.

47

$$\begin{array}{r}
 \text{Ex. 4. \$ } .92 \\
 .104 \\
 .357 \\
 .186 \\
 .444 \\
 .125 \\
 .99 \\
 \hline
 \$3.126 \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 \text{Ex. 5. \$89.74} \\
 13.08 \\
 6.375 \\
 19.625 \\
 \hline
 \$128.77, \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 \text{Ex. 6. \$ } 9.17 \\
 .875 \\
 .0625 \\
 .04 \\
 .08 \\
 .11 \\
 \hline
 \$10.3375, \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 \text{Ex. 7. \$2175.75} \\
 240.375 \\
 605.40 \\
 140.125 \\
 \hline
 \$3161.65, \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 \text{Ex. 8. \$ } 6.08 \\
 26.625 \\
 16.000 \\
 7.40 \\
 \hline
 \$56.105, \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 \text{Ex. 9. \$7425.50} \\
 253.96 \\
 170.09 \\
 \hline
 \$7849.55, \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 \text{Ex. 10. \$3.625} \\
 1.75 \\
 1.375 \\
 .625 \\
 .875 \\
 \hline
 \$8.25, \text{ Ans.}
 \end{array}$$

SUBTRACTION.

(164, page 136.)

Ex. 2. \$365.005

$$\begin{array}{r} 267.018 \\ \hline \end{array}$$

$$\$97.987, \text{ Ans.}$$

Ex. 3. \$50.

$$\begin{array}{r} .50 \\ \hline \end{array}$$

$$\$49.50, \text{ Ans.}$$

Ex. 4. \$100.

$$\begin{array}{r} .001 \\ \hline \end{array}$$

$$\$99.999, \text{ Ans.}$$

Ex. 5. \$1000.

$$\begin{array}{r} .037 \\ \hline \end{array}$$

$$\$999.963, \text{ Ans.}$$

Ex. 6. \$1834.16

$$\begin{array}{r} 1575.24 \\ \hline \end{array}$$

$$\$258.92, \text{ Ans.}$$

Ex. 7. \$145.27

$$\begin{array}{r} 37.69 \\ \hline \end{array}$$

$$\$107.58, \text{ Ans.}$$

Ex. 8. \$6.84

$$\begin{array}{r} 5.625 \\ \hline \end{array}$$

$$\$1.215, \text{ Ans.}$$

Ex. 9. \$14725

$$\$3560 + \$7015.875 = 10575.875$$

$$\$4149.125, \text{ Ans.}$$

Ex. 10. \$13.75

$$\begin{array}{r} 5.25 \\ 1.375 \\ .875 \\ \hline \end{array}$$

$$\$25 - \$21.25 = \$3.75, \text{ Ans.}$$

Ex. 11. \$480

$$\begin{array}{r} 80.50 \\ \hline \end{array}$$

$$\$560.50 - \$200 = \$360.50, \text{ Ans.}$$

MULTIPLICATION.

(165, page 137.)

Ex. 2. $\$4.275 \times 300 = \$1282.50, \text{ Ans.}$

Ex. 3. $\$2.45 \times 175 = \$428.75, \text{ Ans.}$

Ex. 4. $\$1.28 \times 800 = \1024 , *Ans.*

Ex. 5. $\$.15 \times 372 = \55.80
 $.125 \times 434 = 54.25$
 $.33 \times 16 = 5.28$

 $\$115.33$, *Ans.*

Ex. 6. $\$.56 \times 3 = \1.68
 $.07 \times 15 = 1.05$
 $.08 \times 27 = 2.16$

 $\$5 - \$4.89 = \$1.11$, *Ans.*

Ex. 7. $\$.375 \times 125 = \46.875
 $.09 \times 75 = \$6.75$
 $.60 \times 12 = 7.20$

 $= 13.95$

 $\$32.925$, *Ans.*

Ex. 8. $\$32.50 \times 80 = \2600
 $34.25 \times 70 = 2397.50$

 $\$4997.50$
 3975

 $\$1022.50$, *Ans.*

DIVISION.

(166, page 138.)

Ex. 2. $\$41.25 \div 33 = \1.25 , *Ans.*

Ex. 3. $\$94.50 \div 27 = \3.50 , *Ans.*

Ex. 4. $\$136 \div 64 = \2.125 , *Ans.*

Ex. 5. $\$1.32 \div \$.12 = 11$, *Ans.*

Ex. 6. $\$405 \div \$.54 = 750$, *Ans.*

Ex. 7. $\$180 \div 12 = \15 , *Ans.*

Ex. 8. $\$2847.50 \div 100 = \28.475 , *Ans.*

Ex. 9. $\$80.46 \div 894 = \$.09$, *Ans.*

Ex. 10. $\$1.125 \times 120 = \135 ; $\$135 \div 27 = \5 , *Ans.*

Ex. 11. $\$3.20 \times 4 = \12.80

$.08 \times 37 = 2.96$

$\$15.76$

6.80

$\$8.96 \div \$1.16 = 56, \text{ Ans.}$

Ex. 12. $\$4.50 + \$2.75 = \$7.25;$

$\$166.75 \div \$7.25 = 23, \text{ Ans.}$

Ex. 13. $\$18.48 \div 154 = \$.12, \text{ Ans.}$

Ex. 14. $\$560$

106.75

$\$453.25 \div 14 = \$32.37\frac{1}{2}, \text{ Ans.}$

ADDITIONAL APPLICATIONS

(168, page 139.)

Ex. 2. $693 \times \frac{1}{3} = \$321, \text{ Ans.}$ Ex. 3. $478 \times \frac{1}{2} = \$239, \text{ Ans.}$

Ex. 4. $4266 \times \frac{1}{12} = \$355.50, \text{ Ans.}$

Ex. 5. $1250 \times \frac{1}{8} = \$156.25, \text{ Ans.}$

Ex. 6. $3126 \times \frac{1}{16} = \$195.375, \text{ Ans.}$

Ex. 7. $1935 \times \frac{1}{6} = \$322.50, \text{ Ans.}$

Ex. 8. $56480 \times \frac{1}{4} = \$7060, \text{ Ans.}$

Ex. 9. $1275 \times \frac{1}{5} = \$255, \text{ Ans.}$

(169, page 140.)

Ex. 2. $\$.09 \times 864 = \$77.76, \text{ Ans.}$

Ex. 3. $\$1.25 \times 87 = \$108.75, \text{ Ans.}$

Ex. 4. $\$1.45 \times 400 = \$580, \text{ Ans.}$

Ex. 5. $\$.44 \times 52 \times 16 = \$366.08, \text{ Ans.}$

(170, page 141.)

Ex. 2. $\$175 \div 25 = \$7, \text{ Ans.}$

Ex. 3. $\$200 \div 48 = \$4.16\frac{2}{3}, \text{ Ans.}$

- Ex. 4. $\$1200 \div 96 = \12.50 , *Ans.*
 Ex. 5. $\$56.25 \div 10 = \$5.62\frac{1}{2}$, *Ans.*
 Ex. 6. $\$11.70 \div 18 = \$.65$, *Ans.*
 Ex. 7. $\$10.07 \div 53 = \$.19$, *Ans.*
 Ex. 8. $\$1016 \div 800 = \1.27 , *Ans.*
 Ex. 9. $\$874.65 \div 348 = \2.55 , *Ans.*
 Ex. 10. $\$684.375 \div 365 = \1.875 , *Ans.*

(171, page 142.)

- Ex. 2. $\$5.55 \div \$.15 = 37$, *Ans.*
 Ex. 3. $\$216 \div \$12 = 18$, *Ans.*
 Ex. 4. $\$2178.75 \div \$1.25 = 1743$, *Ans.*
 Ex. 5. $\$643.50 \div \$19.5 = 33$, *Ans.*
 Ex. 6. $\$52.65 \div \$.45 = 117$, *Ans.*
 Ex. 7. $\$6336 \div \$132 = 48$, *Ans.*
 Ex. 8. $\$117715 \div \$65 = 1811$, *Ans.*

(172, page 143.)

- Ex. 2. $\$4.50 \times 42.65 = \191.925 , *Ans.*
 Ex. 3. $\$.85 \times 24.89 = \21.1565 , *Ans.*
 Ex. 4. $\$17.25 \times 7.842 = \135.2745 , *Ans.*
 Ex. 5. $\$12.50 \times 23.48 = \293.50 , *Ans.*
 Ex. 6. $\$3 \times 1.728 = \5.184 , *Ans.*
 Ex. 7. $\$7 \times 2.40 = \16.80
 $5.40 \times .865 = 4.671$
 $.80 \times 12.56 = 10.048$

 $\$31.519$, *Ans.*
 Ex. 8. $\$4.375 \times 14.76 = \64.575 , *Ans.*

(173, page 144.)

- Ex. 2. $\$7 \div 2 = \3.50 ;
 $\$3.50 \times 1.495 = \5.2325 , *Ans.*

Ex. 3. $\$8.75 \div 2 = \4.375 ;
 $\$4.375 \times .325 = \$1.421 +$, *Ans.*

Ex. 4. $\$3.84 \div 2 = \1.92 ;
 $\$1.92 \times 3.142 = \$6.032 +$, *Ans.*

Ex. 5. $\$5.60 \div 2 = \2.80 ;
 $\$2.80 \times 1.848 = \5.1744 , *Ans.*

Ex. 6. $\$18 \div 2 = \9 ;
 $\$9 \times 125 \times .148 = \33.30 , *Ans.*

Ex. 7. $\$3.05 \div 2 = \1.525 ;
 $\$1.525 \times 31.640 = \48.251 , *Ans.*

(174, page 145.)

Ex. 1. $\$3.60 \times 7 = \25.20
 $1.125 \times 9 = 10.125$
 $.90 \times 12 = 10.80$
 $1.375 \times 24 = 33.00$
 $.65 \times 32 = 20.80$

 $\$99.925$, *Ans.*

Ex. 2. $\$3.75 \times 67 = \251.25
 $2.62 \times 108 = 282.96$
 $1.12 \times 75 = 84.00$
 $.86 \times 27 = 23.22$
 $.70 \times 35 = 24.50$
 $1.04 \times 50 = 52.00$

 $\$717.93$, *Ans.*

Ex. 3. $\$.07 \times 325 = \22.75
 $.0625 \times 148 = 9.25$
 $.05 \times 286 = 14.30$
 $.125 \times 95 = 11.875$
 $2.75 \times 50 = 137.50$
 $3.625 \times 75 = 271.875$
 $2.85 \times 12 = 34.20$

 $\$501.75$, *Ans.*

Ex. 4.	\$15	$\times 20$	= \$300.
	9.50	$\times 7.5$	= 71.25
	6.25	$\times 10.75$	= 67.1875
	2.625	$\times 3.96$	= 10.395
	3.00	$\times 5.287$	= 15.861
			<hr/> \$464.6935, <i>Ans.</i>

Ex. 5.	\$11	$\times 25$	= \$2.75
	.625	$\times 5$	= 3.125
	.0625	$\times 26$	= 1.625
	.42	$\times 4$	= 1.68
	.09	$\times 46$	= 4.14
	.14	$\times 30$	= 4.20
	.04	$\times 6$	= .24
	.12	$\times 4$	= .48
			<hr/> \$18.24, <i>Ans.</i>

PROMISCUOUS EXAMPLES.

(Page 146.)

Ex. 1.	\$124.35	$\times 62.75$	= \$7802.9625, <i>Ans.</i>
Ex. 2.	\$17	$\times 15$	= \$2.55, <i>Ans.</i>
Ex. 3.	\$1406.25	$\div 2250$	= \$ $\frac{5}{9}$, <i>Ans.</i>
Ex. 4.	\$48.96	$\div 12$	= \$4.08, <i>Ans.</i>
Ex. 5.	325 miles	$\times .45$	= 146.25 miles, <i>Ans.</i>
Ex. 6.	657	$\div 36.5$	= 18, <i>Ans.</i>
Ex. 7.	\$105 + \$125 + (\$35 \times 4)		= \$370
	\$400 - \$370		= \$30, <i>Ans.</i>
Ex. 8.	\$19 - \$15 = \$4 ; \$4 \times 28		= \$112, <i>Ans.</i>
Ex. 9.	$\frac{2}{3} \times \frac{5}{2} = \frac{10}{3}$		= 7.5, <i>Ans.</i>
Ex. 10.	\$9 \div \$.3125		= 28.8, <i>Ans.</i>
Ex. 11.	\$3.50 \times 365		= \$1277.50
	\$2000 - 1277.50		= \$722.50, <i>Ans.</i>

Ex. 12. $\$687.25 + \$943.64 = \$1630.89$
 $\$1630.89 - \$875.29 = \$755.60$, *Ans.*

Ex. 13. $\$1728 \div 2 = \864 1st half sold for;
 $144 \times 8 = 1152$ 2d " " "

 $\$2016$, *Ans.*

Ex. 14. $\$3.75 \times .875 = \$3.281 +$, *Ans.*

Ex. 15. $\$65.42 - \$46.56 = \$18.86$, gain per head;
 $\$3526.82 \div \$18.86 = 187$, *Ans.*

Ex. 16. $\$54.72 \div 36.48 = \1.50 ;
 $\$1.50 \times 14.25 = \21.375 , *Ans.*

Ex. 17. $\$3548 \div 4 = \887 , *Ans.*

Ex. 18. $112.34 \div \$.82 = 137$, *Ans.*

Ex. 19. $\$3461.50 \div 46 = \75.25 ;
 $\$75.25 \times 5 = \386.25 , *Ans.*

Ex. 20. $\$24000 \times \frac{2}{3} \times \frac{1}{3} = \3200 , *Ans.*

Ex. 21. $\$1.25 \times 160 = \200

$\$5 \times 80 = 400$

 $\$600$

$\$2.50 \times 240 = 600$

Loss 000, *Ans.*

Ex. 22. $\$1.70 \times 48 = \81.60

72.90

$\$ 8.70$, *Ans.*

Ex. 23. $122\frac{1}{2} + 75\frac{1}{4} = 197\frac{3}{4}$; $197\frac{3}{4} - 60 = 137\frac{3}{4}$;

$\$.9375 - \$.8125 = \$.125$, loss per bushel;

$\$.125 \times 137\frac{3}{4} = \$17.218 +$ loss;

12.50 gain;

 $\$4.718 +$, loss, *Ans.*

Ex. 24. $\$1.40 \times 6 = \8.40 wages;

$\$.75 \times 7 = 5.25$ expenses,

 $\$3.15$ savings, *Ans.*

$$\text{Ex. 25. } \frac{\$.08 \times 39}{\$.16} = 19\frac{1}{2}, \text{ Ans.}$$

$$\text{Ex. 26. } \$4.50 \times 23.487 = \$105.6915, \text{ Ans.}$$

$$\text{Ex. 27. } \$1200 \div 365 = \$3.287\frac{2}{3}, \text{ Ans.}$$

$$\text{Ex. 28. } \$.17 \times 56 \times 28 = \$266.56, \text{ Ans.}$$

$$\text{Ex. 29. } \$.07 \times 26 \times 13 \times 16 = \$378.56, \text{ Ans.}$$

$$\text{Ex. 30. } \$4.75 \times 4.868 = \$23.123, \text{ Ans.}$$

$$\begin{aligned} \text{Ex. 31. } & \$.33\frac{1}{3} \times 27 = \$9.00 \\ & .25 \times 28 = 7.00 \\ & .50 \times 19 = 9.50 \\ & \hline & \$25.50, \text{ Ans.} \end{aligned}$$

$$\begin{aligned} \text{Ex. 32. } & 44 - 32 = 12; \\ & \frac{32 \times 8}{12} = 21\frac{1}{3} \text{ minutes, Ans.} \end{aligned}$$

$$\text{Ex. 33. } \frac{\$32.3}{1} \times \frac{4}{19} \times \frac{15}{2} = \$51, \text{ Ans.}$$

$$\text{Ex. 34. } \$5.635 \div .875 = \$6.44; \$6.44 \times 9\frac{1}{4} = \$59.57, \text{ Ans.}$$

$$\begin{aligned} \text{Ex. 35. } & \qquad \qquad \qquad \$5000 \\ & \$1200.25 \times 3 = \$3600.75 \\ & 1800.62 \times 3 = 5401.86 \\ & \hline & \$14002.61 \\ & \$950.87 \times 2 = 1901.74 \\ & \hline & \$12100.87, \text{ Ans.} \end{aligned}$$

$$\text{Ex. 36. } \$4.50 \times 186.40 = \$838.80, \text{ Ans.}$$

$$\text{Ex. 37. } \frac{2\frac{1}{2}}{3\frac{1}{3}} = \frac{5}{2} \times \frac{5}{16} = \frac{25}{32} = .78125, \text{ Ans.}$$

$$\begin{aligned} \text{Ex. 58. } & \$96.40 \div 2 = \$48.20; \\ & \$48.20 \times 1.375 = \$66.275, \text{ Ans.} \end{aligned}$$

$$\text{Ex. 39. } \frac{5.625}{10000} = \frac{9}{16}, \text{ Ans}$$

Ex. 40. $\frac{3}{32} = .09375$; $.62\frac{1}{2} = .625$; $.37\frac{1}{16} = .370625$;
 $\frac{1}{8} = .375$;
 $.09375 + .625 + .370625 + .375 = 1.464375$, *Ans.*

	Dr.		Cr.
Ex. 41.	\$4.745		\$2.765
	2.625		1.245
	1.27		.625
	.45		3.45
	5.285		1.875
	<hr/>		<hr/>
	\$14.375	—	\$9.96 = \$4.415, <i>Ans.</i>

Ex. 42.	\$1.25 × 120 = \$15.00	\$1.50
	.625 × 18 = 11.25	1.27
	.07 × 47 = 3.29	1.87
	.18 × 6 = 1.08	2.30
	<hr/>	<hr/>
	\$30.62	— \$6.94 = \$23.68, <i>Ans.</i>

REDUCTION.

(183, page 152.)

- Ex. 1. 14194 far. ÷ 4 = 3548 d. 2 far.; 3548 d. ÷ 12
 = 295 s. 8 d.; 295 s. ÷ 20 = 14 £ 15 s.
Ans. 14 £ 15 s. 8 d. 2 far.
- Ex. 2. 14 £ × 20 + 15 s. = 295 s.; 295 s. × 12 + 8 d. = 3548 d.;
 3548 d. × 4 + 2 far. = 14194 far., *Ans.*
- Ex. 3. 15 £ × 20 + 19 s. = 319 s.; 319 s. × 12 + 11 d.
 = 3839 d.; 3839 d. × 4 + 3 far. = 15359 far., *Ans.*
- Ex. 4. 15395 far. ÷ 4 = 3839 d. 3 far.; 3839 d. ÷ 12
 = 319 s. 11 d.; 319 s. ÷ 20 = 15 £ 19 s.
Ans. 15 £ 19 s. 11 d. 3 far.
- Ex. 5. 46 sov. × 20 + 12 s. = 932 s.; 932 s. × 12 + 2 d.
 = 11186 d., *Ans.*

- Ex. 6.** $11186 \text{ d.} \div 12 = 932 \text{ s. } 2 \text{ d.}; 932 \text{ s.} \div 20 = 46 \text{ sov}$
 12 s. *Ans.* 46 sov. 12 s. 2 d

(185, page 153.)

- Ex. 3.** $5 \text{ lb.} \times 12 + 7 \text{ oz.} = 67 \text{ oz.}; 67 \text{ oz.} \times 20 + 12 \text{ pwt.} =$
 $1352 \text{ pwt.}; 1352 \text{ pwt.} \times 24 + 9 \text{ gr.} = 32457 \text{ gr.}, \text{ Ans}$
- Ex. 4** $43457 \text{ gr.} \div 24 = 1810 \text{ pwt. } 17 \text{ gr.}; 1810 \text{ pwt.} \div$
 $20 = 90 \text{ oz. } 10 \text{ pwt.}; 90 \text{ oz.} \div 12 = 7 \text{ lb. } 6 \text{ oz.}$
Ans. 7 lb. 6 oz. 10 pwt. 17 gr.
- Ex. 5.** $41760 \text{ gr.} \div 24 = 1740 \text{ pwt.}; 1740 \text{ pwt.} \div 20 = 87 \text{ oz.};$
 $87 \text{ oz.} \div 12 = 7 \text{ lb.} + 3 \text{ oz.}, \text{ Ans.}$
- Ex. 6.** $14 \text{ lb. } 10 \text{ oz. } 18 \text{ pwt.} = 3578 \text{ pwt.};$
 $3578 \times \$.75 = \$2688.50, \text{ Ans.}$
- Ex. 7.** $5 \text{ lb. } 6 \text{ oz.} = 1320 \text{ pwt.}; 2 \text{ oz. } 15 \text{ pwt.} = 55 \text{ pwt.};$
 $1320 \div 55 = 24, \text{ Ans.}$
- Ex. 8.** $1 \text{ lb. } 1 \text{ pwt. } 16 \text{ gr.} = 5800 \text{ gr.}; 4 \text{ pwt. } 20 \text{ gr.} = 116 \text{ gr.};$
 $5800 \div 116 = 50;$
 $\$1.25 \times 50 = \$62.50, \text{ Ans.}$

(186, page 155.)

- Ex. 3.** $16 \text{ lb.} \times 12 + 11 \text{ oz.} = 203 \text{ oz.}; 203 \text{ oz.} \times 8 + 7 \text{ dr.}$
 $= 1631 \text{ dr.}; 1631 \text{ dr.} \times 3 + 2 \text{ sc.} = 4895 \text{ sc.};$
 $4895 \text{ sc.} \times 20 + 19 \text{ gr.} = 97919 \text{ gr.}, \text{ Ans.}$
- Ex. 4.** $47 \text{ lb.} \times 12 + 6 \frac{2}{3} = 570 \frac{2}{3}; 570 \frac{2}{3} \times 8 + 4 \frac{2}{3}$
 $= 4564 \frac{2}{3}; 4564 \frac{2}{3} \times 3 = 13692 \text{ } \textcircled{D}, \text{ Ans.}$
- Ex. 5.** $20 \text{ gr.} \times 5 \times 365 = 36500 \text{ gr.};$
 $36500 \text{ gr.} \div 20 = 1825 \text{ } \textcircled{D}; 1825 \text{ } \textcircled{D} \div 3 = 608 \text{ } 3 \text{ } 1 \text{ } \textcircled{D};$
 $608 \text{ } 3 \div 8 = 76 \frac{2}{3}; 76 \frac{2}{3} \div 12 = 6 \text{ lb. } 4 \frac{2}{3}.$
Ans. 6 lb. 4 $\frac{2}{3}$ 1 $\textcircled{D}.$

(187, page 156.)

- Ex. 3.** $3 \text{ T.} \times 20 + 14 \text{ cwt.} = 74 \text{ cwt.}; 74 \text{ cwt.} \times 100 + 74$
 $\text{lb.} = 7474 \text{ lb.}; 7474 \text{ lb.} \times 16 + 12 \text{ oz.} = 119596$
 $\text{oz.}; 119596 \text{ oz.} \times 16 + 15 \text{ dr.} = 1913551 \text{ dr.}, \text{ Ans.}$

Ex. 4. $1913551 \text{ dr.} \div 16 = 119596 \text{ oz. } 15 \text{ dr.}; 119596 \text{ oz.}$
 $\div 16 = 7474 \text{ lb. } 12 \text{ oz.}; 7474 \text{ lb.} \div 100 = 74 \text{ cwt.}$
 $74 \text{ lb.}; 74 \text{ cwt.} \div 20 = 3 \text{ T. } 14 \text{ cwt.}$
Ans. 3 T. 14 cwt. 74 lb. 12 oz. 15 dr.

Ex. 5. $3 \text{ T. } 15 \text{ cwt. } 20 \text{ lb.} = 7520 \text{ lb.}$
Ans. $\$.22 \times 7520 = \$1654.40.$

Ex. 6. $115 \text{ lb.} \div 2000 = .0575 \text{ T.}; \$10 \times .0575 = \$.575,$
Ans.

Ex. 7.

$217 \text{ lb.} \times 10 = 2170 \text{ lb. @ } \$.06 = \$130.20$
 $306 \text{ lb.} \times 5 = 1530 \text{ lb. @ } \$.07\frac{1}{2} = 114.75$
 $3700 \text{ lb. @ } \$.08 = \$296.00, \text{ which } - \244.95
 $= \$51.05, \text{ Ans.}$

Ex. 8. $2 \text{ T.} \times 2000 = 4000 \text{ lb.}; 4000 \times \$.12\frac{1}{2} = \$500;$
 $\$500 - \$360 = \$140, \text{ Ans.}$

Ex. 9. $10 \text{ T.} \times 20 + 6 \text{ cwt.} = 206 \text{ cwt.}; 206 \text{ cwt.} \times 4 + 3 \text{ qr.}$
 $= 827 \text{ qr.}; 827 \text{ qr.} \times 28 + 14 \text{ lb.} = 23170 \text{ lb.}$
 $\$.06 \text{ buying price.}$
 $\$130 \div 2000 = .065 \text{ selling price.}$
 $\$.005 \text{ gain per pound.}$
 $\$.005 \times 23170 = \$115.85, \text{ Ans.}$

Ex. 10. $2352 \text{ lb.} \div 56 = 42 \text{ bu.};$
 $\$.90 \times 42 \times 2 = \$75.60, \text{ Ans.}$

Ex. 11. $300 \text{ bbl.} \times 196 = 58800 \text{ lb., Ans.}$

Ex. 12. $\$1.25 \times 3 = \3.75 cost.
 $\$.0075 \times 280 \times 3 = 6.30$
 $\$2.55, \text{ Ans.}$

(191, page 157.)

Ex. 1. 5 lb. 10 oz.=90 oz.; $\$.50 \times 90 = \45.00 cost.

$$\frac{\$.12 \times 8 \times 437.5 \times 90}{480} = \$78.75 \text{ sold for.}$$

 $\$33.75$, Ans.Ex. 2. $424 \text{ dr.} \div 8 = 53 \text{ oz.}$; $53 \text{ oz.} \div 12 = 4 \text{ lb. } 5 \text{ oz.}$, AnsEx. 3. $20 \text{ lb. } 8 \text{ oz. } 12 \text{ pwt.} = 119328 \text{ gr.}$

$$119328 \text{ gr.} \div 7000 = 17\frac{41}{75} \text{ lb.}, \text{ Ans.}$$

Ex. 4. $\$.40 \times 16 \times 20 = \128 cost

$$\frac{\$.50 \times 320 \times 437.5}{480} = 145.83\frac{1}{3}$$

 $\$17.83\frac{1}{3}$, Ans.

(193, page 159.)

Ex. 3. $7912 \text{ mi.} \times 63360 = 501304320 \text{ in.}$, Ans.

Ex. 4. $168474 \text{ ft.} \div 3 = 56158 \text{ yd.}$; $56158 \text{ yd.} \div 5\frac{1}{2} = 10210$
 rd. ; $10210 \text{ rd.} \div 40 = 255 \text{ fur. } 10 \text{ rd.}$; $255 \text{ fur.} \div 8 = 31$
 $\text{mi. } 7 \text{ fur.}$ Ans. $31 \text{ mi. } 7 \text{ fur. } 10 \text{ rd. } 3 \text{ yd.}$

Ex. 5. $31 \text{ mi.} \times 8 + 7 \text{ fur.} = 255 \text{ fur.}$; $255 \text{ fur.} \times 40 + 10$
 $\text{rd.} = 10210 \text{ rd.}$; $10210 \text{ rd.} \times 5\frac{1}{2} + 3 \text{ yd.} = 56158 \text{ yd.}$; 56158
 $\text{yd.} \times 3 = 168474 \text{ ft.}$, Ans.

Ex. 6. $2500 \text{ fathoms} \times 6 = 15000 \text{ ft.}$; $15000 \text{ ft.} \div 16\frac{1}{2} =$
 $909 \text{ rd. } 1\frac{1}{2} \text{ ft.}$; $909 \text{ rd.} \div 40 = 22 \text{ fur. } 29 \text{ rd.}$; $22 \text{ fur.} \div 8 =$
 $2 \text{ mi. } 6 \text{ fur.}$ Ans. $2 \text{ mi. } 6 \text{ fur. } 29 \text{ rd. } 1\frac{1}{2} \text{ ft.}$

Ex. 7. $2200 \text{ mi.} \times 5280 = 11616000 \text{ ft.}$;

$$\$10 \times 11616000 = \$11616000, \text{ Ans.}$$

Ex. 8. $4 \text{ fathoms} \times 6 + 3 \text{ ft.} = 27 \text{ ft.}$; $27 \text{ ft.} \times 12 + 8 \text{ in.} =$
 332 in. Ans.

Ex. 9. $200 \text{ mi.} = 12672000 \text{ in.}$; $18 \text{ ft. } 4 \text{ in.} = 220 \text{ in.}$;

$$12672000 \div 220 = 57600 \text{ times, Ans.}$$

Ex. 10. $120 \text{ lea.} \times 3 = 360 \text{ geo. mi.}$; $360 \text{ geo. mi.} \times 1.15 =$
 414 Eng. mi. , Ans.

Ex. 11. $14\frac{1}{2} \text{ hands} \times 4 = 58 \text{ in.}$, Ans.

(194, page 160.)

Ex. 1. $3 \text{ mi.} \times 80 + 51 \text{ ch.} = 291 \text{ ch.}$; $291 \text{ ch.} \times 100 + 73 \text{ l.} = 29173 \text{ l.}$, *Ans.*

Ex. 2. $29173 \text{ l.} \div 100 = 291 \text{ ch.}$ 73 l. ; $291 \text{ ch.} \div 80 = 3 \text{ mi.}$ 51 ch. .
Ans. 3 mi. 51 ch. 73 l.

Ex 3. 17 ch. $31 \text{ l.} = 17.31 \text{ ch.}$

12 ch. $87 \text{ l.} = 12.87 \text{ ch.}$

30.18 ch. half round the field.

$30.18 \text{ ch.} \times 2 \times 66 = 3983.76 \text{ ft.}$, *Ans.*

(196, page 163.)

Ex. 3. $87 \text{ A.} \times 4 + 2 \text{ R.} = 350 \text{ R.}$; $350 \text{ R.} \times 40 + 38 \text{ sq. rd.} = 14038 \text{ sq. rd.}$; $14038 \text{ sq. rd.} \times 30\frac{1}{4} + 7 \text{ sq. yd.} = 424656\frac{1}{2} \text{ sq. yd.}$; $424656\frac{1}{2} \text{ sq. yd.} \times 9 + 1 \text{ sq. ft.} = 3821909\frac{1}{2} \text{ sq. ft.}$; $3821909\frac{1}{2} \text{ sq. ft.} \times 144 + 100 \text{ sq. in.} = 550355068 \text{ sq. in.}$, *Ans.*

Ex. 4. $550355068 \text{ sq. in.} \div 144 = 3821910 \text{ sq. ft.}$ 28 sq. in. ; $3821910 \text{ sq. ft.} \div 9 = 424656 \text{ sq. yd.}$ 6 sq. ft. ; $424656 \text{ sq. yd.} \div 30\frac{1}{4} = 14038 \text{ sq. rd.}$ $6\frac{1}{2} \text{ sq. yd.}$; $14038 \text{ sq. rd.} \div 40 = 350 \text{ R.}$ 38 sq. rd. ; $350 \text{ R.} \div 4 = 87 \text{ A.}$ 2 R.

Ans. 87 A. 2 R. 38 sq. rd. $6\frac{1}{2} \text{ sq. yd.}$ 6 sq. ft. 28 sq. in.

But $(\frac{1}{2} \text{ sq. rd.}) = 4 \text{ sq. ft.}$ 72 sq. in.

Hence, *Ans.* 87 A. 2 R. 38 sq. rd. 7 sq. yd. 1 sq. ft. 100 sq. in.

Ex. 5. $100 \times 30 = 3000 \text{ sq. rd.} = 18 \text{ A.}$ 3 R. , *Ans.*

Ex. 6. $4 \text{ mi.} \times 320 = 1280 \text{ rd.}$, *Ans.*

Ex. 7. $2 \text{ mi.} \times 320 = 640 \text{ rd.}$, *Ans.*

Ex. 8. $100000 \text{ sq. ft.} \div 9 = 11111 \text{ sq. yd.}$ 1 sq. ft. ;

$111.1 \text{ sq. yd.} \div 30\frac{1}{4} = 367 \text{ sq. rd.}$ $9\frac{1}{4} \text{ sq. yd.}$

$367 \text{ sq. rd.} \div 40 = 9 \text{ R.}$ 7 sq. rd.

$9 \text{ R.} \div 4 = 2 \text{ A.}$ 1 R.

Ans. 2 A. 1 R. 7 sq. rd. $9\frac{1}{4} \text{ sq. yd.}$ 1 sq. ft. ; or

2 A 1 R. 7 sq. rd. 9 sq. yd. $3\frac{1}{4} \text{ sq. ft.}$

Ex. 9. $18\frac{1}{2} \times 16 = 296$ sq. ft.;
 296 sq. ft. $\div 9 = 32\frac{8}{9}$ sq. yd., *Ans.*

Ex. 10. $(18 + 16\frac{1}{2}) \times 2 = 69$ ft., distance round the room;
 $\frac{69 \times 9}{9} = 69$ sq. yd., in the walls;
 $\frac{18 \times 16\frac{1}{2}}{9} = 33$ sq. yd., in ceiling;
 69 sq. yd. $+ 33$ sq. yd. $= 102$ sq. yd.
 $\$.22 \times 102 = \22.44 , *Ans.*

Ex. 11. $40 \times 20 \times 2 = 1600$ sq. ft. $= 16$ squares;
 $\$10 \times 16 = \160 , *Ans.*

(197, page 164.)

Ex. 2. 3686400 P. $\div 102400 = 36$ sq. mi., *Ans.*

Ex. 3. 94 A. $\times 10 + 7$ sq. ch. $= 947$ sq. ch.;
 947 sq. ch. $\times 16 + 12$ P. $= 15164$ P.;
 15164 P. $\times 625 + 118$ sq. l. $= 9477618$ sq. l., *Ans.*

Ex. 4. 4550000 sq. l. $\div 10000 = 455$ A.
 $\$50 \times 455 = \22750 , *Ans.*

(199, page 166.)

Ex. 1. 125 cu. ft. $\times 1728 + 840$ cu. in. $= 216840$ cu. in., *Ans.*

Ex. 2. 5224 cu. ft. $\div 128 = 40\frac{1}{8}$ Cd., *Ans.*

Ex. 3. 3 ft. 2 in. $= 38$ in.; 2 ft. 2 in. $= 26$ in.; 1 ft. 8 in. $= 20$ in.;
 $38 \times 26 \times 20 = 19760$ cu. in., *Ans.*

Ex. 4. $6 \times 6 \times 6 = 216$ cu. ft.;
 216 cu. ft. $\times 1728 = 373248$ cu. in., *Ans.*

Ex. 5. $60 \times 20 \times 15 = 18000$ cu. ft.;
 18000 cu. ft. $\div 128 = 140\frac{5}{8}$ Cd., *Ans.*

Ex. 6. $10 \times 3\frac{1}{4} \times 3\frac{1}{4} = 113\frac{3}{4}$ cu. ft., *Ans.*

Ex. 7. $128 \div (3 \times 12) = 3\frac{1}{3}$ ft. high, *Ans.*

Ex. 8. $27 \times 175 \text{ lb.} = 4725 \text{ lb.} = 2 \text{ T. } 7 \text{ cwt. } 25 \text{ lb., Ans.}$

Ex. 9. $32 \text{ ft.} + 24 \text{ ft.} = 56 \text{ ft.}; 56 \text{ ft.} \times 2 = 112 \text{ ft. girt};$
 $112 \times 1\frac{1}{2} \times 6 = 1008 \text{ cu. ft.}; 1008 \text{ cu. ft.} \div 24\frac{3}{4} = 40\frac{8}{11} \text{ Pch.};$
 $\$1.25 \times 40\frac{8}{11} = \$50.909 +, \text{ Ans.}$

Ex. 10. $\$.15 \times \frac{32 \times 24 \times 6}{27} = \$25.60, \text{ Ans.}$

Ex. 11. $10 \times 9 \times 8 = 720 \text{ cu. ft.};$
 $720 \div 10 = 72 \text{ minutes, Ans.}$

Ex. 12. $30 \times 20 \times 10 = 6000 \text{ cu. ft.};$
 $\frac{6000}{50 \times 10} = 12 \text{ minutes, Ans.}$

(200, page 168.)

Ex. 3. $3 \text{ hhd.} \times 2016 = 6048 \text{ gi., Ans.}$

Ex. 4. $6048 \text{ gi.} \div 2016 = 3 \text{ hhd., Ans.}$

Ex. 5. $13 \text{ hhd.} \times 63 + 15 \text{ gal.} = 834 \text{ gal.}; 834 \text{ gal.} \times 4 \times 1$
 $\text{qt.} = 3337 \text{ qt.}; 3337 \text{ qt.} \times 2 = 6674 \text{ pt., Ans.}$

Ex. 6. $6674 \text{ pt.} \div 2 = 3337 \text{ qt.}; 3337 \text{ qt.} \div 4 = 834 \text{ gal. } 1$
 $\text{qt.}; 834 \text{ gal.} \div 63 = 13 \text{ hhd. } 15 \text{ gal.}$

$13 \text{ hhd. } 15 \text{ gal. } 1 \text{ qt. Ans.}$

Ex. 7. $1 \text{ hhd.} = 2016 \text{ gi.}; \$.06 \times 2016 = \$120.96, \text{ Ans.}$

Ex. 8. $\$2 \times 10 = \$20 \text{ cost}; \$.05 \times 4 \times 31\frac{1}{2} \times 10 = \63 recd.
 $\$63 - \$20 = \$43 \text{ gain, Ans.}$

Ex. 9. $\$3.84 \div \$.06 = 64 \text{ pt.} = 8 \text{ gal., Ans.}$

Ex. 10. $2 \text{ gal. } 2 \text{ qt. } 1 \text{ pt.} = 21 \text{ pt.}; 1 \text{ hhd.} = 504 \text{ pt.};$
 $504 \div 21 = 24, \text{ Ans.}$

(201, page 169.)

Ex. 1. $49 \text{ bu.} \times 4 + 3 \text{ pk.} = 199 \text{ pk.}; 199 \text{ pk.} \times 8 + 7 \text{ qt.} =$
 $1599 \text{ qt.}; 1599 \text{ qt.} \times 2 + 1 \text{ pt.} = 3199 \text{ pt., Ans.}$

Ex. 2. $3199 \text{ pt.} \div 2 = 1599 \text{ qt. } 1 \text{ pt.}$; $1599 \text{ qt.} \div 8 = 199 \text{ pk. } 7 \text{ qt.}$; $199 \text{ pk.} \div 4 = 49 \text{ bu. } 3 \text{ pk.}$

Ans. 49 bu. 3 pk. 7 qt. 1 pt.

Ex. 3. $1 \text{ bu.} \times 4 + 1 \text{ pk.} = 5 \text{ peck}$; $5 \text{ pk.} \times 8 + 1 \text{ qt.} = 41 \text{ qt.}$; $41 \text{ qt.} \times 2 + 1 \text{ pt.} = 83 \text{ pt.}$, *Ans.*

Ex. 4. $83 \text{ pt.} \div 2 = 41 \text{ qt. } 1 \text{ pt.}$; $41 \text{ qt.} \div 8 = 5 \text{ pk. } 1 \text{ qt.}$; $5 \text{ pk.} \div 4 = 1 \text{ bu. } 1 \text{ pk.}$ *Ans.* 1 bu. 1 pk. 1 qt. 1 pt.

Ex. 5. $\$.65 \times 50 = \32.50 cost;
 $\$.25 \times 4 \times 50 = \50.00 sold for;
 $\$17.50$ *Ans.*

(205, page 170.)

Ex. 1. $1 \text{ bu. (Dry Measure)} = 2150\frac{2}{3} \text{ cu. in.}$;
 $2150\frac{2}{3} \text{ cu. in.} \div 57\frac{3}{4} = 37\frac{1}{2} \text{ wine quarts}$;
 $37\frac{1}{2} \text{ qts.} - 32 = 5\frac{1}{2} \text{ qts.}$, *Ans.*

Ex. 2. $40 \text{ qt.} \div 4 = 10 \text{ gal.}$; $10 \text{ gal.} \times 282 = 2820 \text{ cu. in.}$;
 $2820 \text{ cu. in.} \div 57\frac{3}{4} = 48\frac{4}{7} \text{ qts. Wine Measure}$;
 $48\frac{4}{7} \text{ qts.} - 40 \text{ qts.} = 8\frac{4}{7} \text{ qts.}$, *Ans.*

Ex. 3. $1 \text{ bu. Dry Measure} = 2150\frac{2}{3} \text{ cu. in.}$
 $32 \text{ qt. Wine Measure} = 1848 \text{ cu. in.}$
 $302\frac{2}{3} \text{ cu. in.}$, *Ans.*

(206, page 171.)

Ex. 1. $365 \text{ da.} \times 24 + 5 \text{ h.} = 8765 \text{ h.}$; $8765 \text{ h.} \times 60 + 48 \text{ min.} = 525948 \text{ min.}$; $525948 \text{ min.} \times 60 + 40 \text{ sec.} = 31556926 \text{ sec.}$, *Ans.*

Ex. 2. $31556926 \text{ sec.} \div 60 = 525948 \text{ min. } 46 \text{ sec.}$;
 $525948 \text{ min.} \div 60 = 8765 \text{ h. } 48 \text{ min.}$; $8765 \text{ h.} \div 24 = 365 \text{ da. } 5 \text{ h.}$ *Ans.* 365 da. 5 h. 48 min. 46 sec.

Ex. 3. $5 \text{ wk.} \times 7 + 1 \text{ da.} = 36 \text{ da.}$; $36 \text{ da.} \times 24 + 1 \text{ h.} = 865 \text{ h.}$; $865 \text{ h.} \times 60 + 1 \text{ min.} = 51901 \text{ min.}$; $51901 \text{ min.} \times 60 + 1 \text{ sec.} = 3114061 \text{ sec.}$, *Ans.*

Ex. 4. $3114061 \text{ sec.} \div 60 = 51901 \text{ min. } 1 \text{ sec.}$; $51901 \text{ min.} \div 60 = 865 \text{ h. } 1 \text{ min.}$; $865 \text{ h.} \div 24 = 36 \text{ da. } 1 \text{ h.}$; $36 \text{ da.} \div 7 = 5 \text{ wk. } 1 \text{ da.}$

Ans. 5 wk. 1 da. 1 h. 1 min. 1 sec.

Ex. 6. $10 \text{ mi.} = 17600 \text{ yd.}$;
 $17600 \text{ sec.} \div 60 = 293 \text{ min. } 20 \text{ sec.}$; $293 \text{ min.} \div 60 = 4 \text{ h. } 53 \text{ min.}$ *Ans.* 4 h. 53 min. 20 sec.

Ex. 7. $29 \text{ da.} \times 24 + 12 \text{ h.} = 708 \text{ h.}$; $708 \text{ h.} \times 60 + 44 \text{ min.} = 42524 \text{ min.}$; $42524 \text{ min.} \times 60 + 3 \text{ sec.} = 2551443 \text{ sec.}$, *Ans.*

Ex. 8. $40 \text{ yr.} \times 365\frac{1}{4} = 14610 \text{ da.}$; $14610 \text{ da.} \times 45 = 657450 \text{ min.}$ gained.
 $657450 \text{ min.} \div 60 = 10957 \text{ h. } 30 \text{ min.}$; $10957 \text{ h.} \div 24 = 456 \text{ da. } 13 \text{ h.}$ *Ans.* 456 da. 13 h. 30 min.

(207, page 173.)

Ex. 1. $10 \text{ S.} \times 30 + 10^\circ = 310^\circ$; $310^\circ \times 60 + 10' = 18610'$;
 $18610' \times 60 + 10'' = 1116610''$, *Ans.*

Ex. 2. $1116610'' \div 60 = 18610' 10''$; $18610' \div 60 = 310^\circ 10'$;
 $310^\circ \div 30 = 10 \text{ S. } 10^\circ$. *Ans.* 10 S. $10^\circ 10' 10''$.

Ex. 3. $11400' \div 60 = 190^\circ$, *Ans.*

Ex. 4. $190^\circ \times 69\frac{1}{2} = 13148 \text{ miles}$, *Ans.*

Ex. 5. $360^\circ \times 60 = 21600'$, *Ans.*

Ex. 6. $397' \div 60 = 6^\circ 37'$, *Ans.*

(210, page 174.)

Ex. 1. $150000000 \div 12 = 12500000 \text{ doz.}$;
 $12500000 \text{ doz.} \div 12 = 1041666 \text{ gross } 8 \text{ doz.}$;
 $1041666 \text{ gross} \div 12 = 86805 \text{ great gross} + 6 \text{ gross.}$
Ans. 86805 great gross 6 gross 8 doz.

Ex. 2. $100000 \text{ sheets} \div 24 = 4166 \text{ quires } 16 \text{ sheets};$
 $4166 \text{ quires} \div 20 = 208 \text{ reams } 6 \text{ quires};$
 $208 \text{ reams} \div 2 = 104 \text{ bundles};$
 $104 \text{ bundles} \div 5 = 20 \text{ bales } 4 \text{ bundles.}$
Ans. 20 bales 4 bundles 6 quires 16 sheets.

Ex. 3. $20 \text{ years} \times 4 + 10 \text{ years} = 90 \text{ years, } Ans.$

Ex. 4. $8 \text{ sheets} \times 8 = 64 \text{ leaves}; 64 \text{ leaves} \times 2 = 128 \text{ pages,}$
Ans.

Ex. 5. $32 \text{ pages} \times 10 \times 2 = 640 \text{ pages, } Ans.$

PROMISCUOUS EXAMPLES IN REDUCTION.

Ex. 1. $6 \text{ yd. } 3\frac{3}{4} \text{ qr.} = 27\frac{3}{4} \text{ qr.}; 333 \text{ yd.} = 1332 \text{ qr.};$
 $1332 \div 27\frac{3}{4} = 48 \text{ suits, } Ans.$

Ex. 2. $1 \text{ oz. } 15 \text{ pwt.} = 35 \text{ pwt.};$
 $\$.70 \times 35 = \$24.50, Ans.$

Ex. 3. $2 \text{ lb. } 3 \frac{5}{8} 5 \text{ } 1 \text{ } 10 \text{ gr.} = 13290 \text{ gr.};$
 $13290 \div 15 = 886, Ans.$

Ex. 4. $1 \text{ T. } 11 \text{ cwt. } 12 \text{ lb.} = 3112 \text{ lb.};$
 $3112 \times \$.01\frac{1}{4} = \$38.90, Ans.$

Ex. 5. $1456 \text{ lb.} \div 32 = 45.5 \text{ bu.};$
 $\$.375 \times 45.5 = \$17.0625, Ans.$

Ex. 6. $45 \text{ lb.} \times 1000 = 45000 \text{ lb.}$
 $45000 \text{ lb.} \div 196 = 229 \text{ bbl. } 116 \text{ lb., } Ans.$

Ex. 7. $2430 \text{ lb.} \div 60 = 40.5 \text{ bu.};$
 $\$1.20 \times 40.5 = \$48.60, Ans.$

Ex. 8. $\$12.50 \div 200 = \$.06\frac{1}{4}, Ans.$

Ex. 9. $360^\circ \times 69.15 = 24897.6 \text{ stat. mi.};$
 $24897.6 \times 63360 = 1577511936, Ans.$

Ex. 10. $10 \text{ mi.} \times 80 + 7 \text{ ch.} + 1 \text{ ch.} (4 \text{ rd.}) = 808 \text{ ch.}; 808$
 $\text{ch.} \times 100 + 20 \text{ l.} = 80820 \text{ l., } Ans.$

Ex. 11. $25 \times 100 \times 144 = 360000$ sq. in. ;
 $\$.01 \times 360000 = \3600 , *Ans.*

Ex. 12. $50 \times 25 \times 10 = 12500$ cu. ft. ;
 12500 cu. ft. $\div 16 = 781$ cd. ft. 4 cu. ft. ;
 781 cd. ft. $\div 8 = 97$ Cd. 5 cd ft. ;
Ans. 97 Cd. 5 cd. ft. 4 cu. ft.

Ex. 13. $10 \times 10 \times 10 \times 1728 = 1728000$ cu. in. ;
 1728000 cu. in. $\div 231 = 7480\frac{4}{7}$ gal. ;
 $7480\frac{4}{7}$ gal. $\div 63 = 118$ hhd. $464\frac{2}{3}$ gal., *Ans.*

Ex. 14. $8 \times 5 \times 4\frac{1}{2} = 180$ cu. ft. $= 311040$ cu. in. ;
 311040 cu. in. $\div 2150.4 = 144\frac{2}{3}$ bu., *Ans.*

Ex. 15. Mar. 31 da. June 30 da. Sept. 30 da.
 Apr. 30 da. July 31 da. Oct. 31 da.
 May 31 da. Aug. 31 da. Nov. 30 da.

Spring, 92 da. Summer, 92 da. Autumn 91 da.
 92 da. $- 91$ da. $= 1$ da. $= 86400$ sec., *Ans.*

Ex. 16. 1296000 sec. $\div 86400 = 15$ da., *Ans.*

Ex. 17. $\frac{20 \times 19}{9} = 40$ yd., *Ans.*

Ex. 18. 4 reams $\times 20 + 10$ quires $= 90$ quires ; 90 quires $\times 24 + 10$ sheets $= 2170$ sheets, *Ans.*

Ex. 19. 16 ft. 6 in. $= 1$ rd. ; 1 mi. $= 320$ rd. ; $320 \div 1 = 320$ times in 1 mi. $320 \times 42 = 13440$ times, *Ans.*

Ex. 20. 1000000 sec. $\div 60 = 16666$ min. 40 sec. ;
 16666 min. $\div 60 = 277$ h. 46 min. ;
 277 h. $\div 10 = 27$ da. 7 h. ;
Ans. 27 da. 7 h. 46 min. 40 sec.

Ex. 21. $6 \times 4\frac{1}{2} = 27$ sq. mi. ; $\frac{27 \times 640}{80} = 216$ farms, *Ans.*

Ex. 22. 10 mi. 176 rd. $= 3376$ rd.
 $\$21.75 \times 3376 = \73428 , *Ans.*

(211, page 176.)

- Ex. 2. $1\frac{1}{5}\text{ f} \times 2 \times 12 = 2\frac{2}{5}\text{ d.}, \text{Ans.}$
 Ex. 3. $1\frac{1}{4}\frac{1}{8}\text{ wk.} \times 7 \times 24 \times 60 = 1\frac{1}{2}\text{ min.}, \text{Ans.}$
 Ex. 4. $1\frac{1}{3}\text{ hhd.} \times 2 \times 1 \times 1 \times 1 = \frac{1}{2}\text{ gi.}, \text{Ans.}$
 Ex. 5. $1\frac{1}{8}\text{ oz.} \times 2 \times 2 = \frac{1}{2}\text{ gr.}, \text{Ans.}$
 Ex. 6. $1\frac{1}{8}\frac{1}{8}\frac{1}{8}\text{ mi.} \times 2 \times 1 \times 2 \times 12 = 1\frac{1}{2}\frac{1}{2}\text{ in.}, \text{Ans}$
 Ex. 7. $\frac{2}{3} \times \frac{1}{2} \times \frac{1}{4}\text{ lb.} \times 12 = \frac{1}{2}\text{ oz.}, \text{Ans.}$
 Ex. 8. $1\frac{1}{8}\text{ hhd.} \times 2 \times 1 \times 1 = 2\frac{1}{8}\text{ pt.}, \text{Ans.}$
 Ex. 9. $1\frac{7}{8}\text{ A.} \times \frac{1}{4} \times 12 = \frac{7}{2}\text{ rd.}, \text{Ans.}$

(212, page 177.)

- Ex. 2. $\frac{1}{4}\text{ ft.} \times \frac{2}{3} = 1\frac{1}{3}\text{ rd.}, \text{Ans.}$
 Ex. 3. $\frac{2}{3}\text{ dr.} \times \frac{1}{16} \times \frac{1}{16} = 1\frac{1}{2}\frac{1}{8}\text{ lb.}, \text{Ans.}$
 Ex. 4. $\frac{1}{2}\text{ ct.} \times 1\frac{1}{8} = 2\frac{1}{8}\text{ E.}, \text{Ans.}$
 Ex. 5. $\frac{1}{3}\text{ ft.} \times 2\frac{1}{8} = 1\frac{1}{4}\frac{1}{4}\text{ mi.}, \text{Ans.}$
 Ex. 6. $\frac{2}{3} \times \frac{1}{4}\text{ pwt.} \times \frac{1}{16} \times \frac{1}{2} = 2\frac{1}{8}\text{ lb.}, \text{Ans.}$
 Ex. 7. $\frac{2}{3}\text{ pt.} \times \frac{1}{2} \times \frac{1}{4} \times \frac{1}{8} = \frac{1}{8}\text{ hhd.}$
 $\frac{1}{2}\text{ hhd.} - \frac{1}{8}\text{ hhd.} = \frac{3}{8}\text{ hhd.}, \text{Ans.}$
 Ex. 8. $\frac{2}{3}\text{ in.} \times 1\frac{1}{8} = 1\frac{1}{4}\frac{1}{8}\text{ mi.}, \text{Ans.}$
 Ex. 9. $\frac{2}{3}\text{ oz.} \times \frac{1}{2} = \frac{1}{3}\text{ lb.} = \frac{1}{3}\text{ of } 2\text{ lb.}; \text{ and } \frac{1}{2}\text{ of } 2\text{ lb. is}$
 $\frac{2}{3}\text{ of } \frac{2}{3}\text{ of } \frac{1}{2}\text{ of } 2\text{ lb.}, \text{ or } \frac{2}{3}\text{ of } \frac{1}{2}\text{ of } 2\text{ lb.}, \text{Ans.}$
 Ex. 10. $\frac{2}{3}\text{ oz.} \times \frac{1}{2} = \frac{1}{3}\text{ lb.} = \frac{1}{3}\text{ of } 2\text{ lb.}; \text{ and } \frac{1}{2}\text{ of } 2\text{ lb. is}$
 $\frac{1}{2}\text{ of } \frac{1}{3}\text{ of } \frac{1}{2}\text{ of } 2\text{ lb.}, \text{ or } \frac{1}{6}\text{ of } \frac{2}{3}\text{ of } 2\text{ lb.}, \text{Ans.}$

(213, page 178.)

- Ex. 2. $\frac{1}{4}\text{ mo.} \times 30 = 17\frac{1}{2}\text{ da.}; \frac{1}{4}\text{ da.} \times 24 = 3\frac{3}{4}\text{ h.}; \frac{3}{4}\text{ h.} \times$
 $60 = 25\frac{1}{2}\text{ min.}; \frac{1}{4}\text{ min.} \times 60 = 42\frac{1}{2}\text{ sec.}$
Ans. 17 da. 3 h. 25 min. 42 $\frac{1}{2}$ sec.
 Ex. 3. $\frac{3}{4}\text{ £} \times 20 = 8\frac{1}{2}\text{ s.}; \frac{1}{4}\text{ s.} \times 12 = 6\frac{1}{2}\text{ d.}; \frac{1}{4}\text{ d.} \times 4 = 3\frac{1}{2}\text{ f}$
Ans. 8 s. 6 d. 3 $\frac{1}{2}$ far.

Ex. 4. $\frac{3}{4}$ bu. $\times 4 = 1\frac{3}{4}$ pk.; $\frac{3}{4}$ pk. $\times 8 = 4\frac{1}{2}$ qt.; $\frac{4}{5}$ qt. $\times 2 = 1\frac{2}{5}$ pt.
Ans. 1 pk. 4 qt. $1\frac{2}{5}$ pt.

Ex. 5. $\frac{4}{5}$ of 15 cwt. $= 12\frac{4}{5}$ cwt.; $\frac{4}{5}$ cwt. $\times 100 = 85\frac{4}{5}$ lb.;
 $\frac{4}{5}$ lb. $\times 16 = 11\frac{4}{5}$ oz.; $\frac{4}{5}$ oz. $\times 16 = 6\frac{4}{5}$ dr.
Ans. 12 cwt. 85 lb. 11 oz. $6\frac{4}{5}$ dr.

Ex. 6. $\frac{3}{4} \times \frac{4}{5} \times \frac{1}{2} = 4\frac{3}{10}$ oz.; $\frac{3}{10}$ oz. $\times 16 = 11\frac{3}{5}$ di.
Ans. 4 oz. $11\frac{3}{5}$ dr.

Ex. 7. $\frac{5}{8}$ A. $\times 4 = 3\frac{1}{2}$ R.; $\frac{1}{2}$ R. $\times 40 = 13\frac{1}{2}$ P.
Ans. 3 R. $13\frac{1}{2}$ P.

Ex. 8. $\frac{1}{2}$ da. $\times 24 = 16\frac{1}{3}$ h.; $\frac{1}{3}$ h. $\times 60 = 36\frac{1}{3}$ min.; $1\frac{1}{3}$ min. $\times 60 = 55\frac{1}{3}$ sec.
Ans. 16 h. 36 min. $55\frac{1}{3}$ sec.

Ex. 9. $\frac{3}{4}$ lb. $\times 12 = 7\frac{1}{2}$ oz.; $\frac{1}{2}$ oz. $\times 20 = 4$ pwt.
Ans. 7 oz. 4 pwt.

Ex. 10. $\frac{7}{8}$ of $\frac{1}{2}$ T. $= 4\frac{7}{8}$ T.; $\frac{7}{8}$ T. $\times 20 = 5\frac{7}{4}$ cwt.; $\frac{7}{4}$ cwt. $\times 100 = 55\frac{7}{4}$ lb.
Ans. 4 T. 5 cwt. $55\frac{7}{4}$ lb.

Ex. 11. $\frac{3}{4}$ of $\frac{1}{3}$ A. $= 1\frac{1}{4}$ A.; $\frac{3}{4}$ A. $\times 4 = 1\frac{1}{2}$ R.; $\frac{1}{2}$ R. $\times 40 = 20$ P.
Ans. 1 A. 1 R. 20 P.

(214, page 179.)

Ex. 2. 6 fur. 26 rd. 3 yd. 2 ft. $= 4400$ ft.; 1 mi. $= 5280$ ft.;
 $\frac{4}{5}\frac{4}{5}\frac{4}{5}$ mi. $= \frac{4}{5}$ mi., *Ans.*

Ex. 3. 13 s. 7 d. 3 far. $= 655$ far.; 1 £ $= 960$ far.;
 $\frac{4}{5}\frac{4}{5}\frac{4}{5}$ £ $= 1\frac{3}{5}$ £, *Ans.*

Ex. 4. 10 oz. 10 pwt. 10 gr. $= 5050$ gr.; 1 lb. $= 5760$ gr.;
 $\frac{4}{5}\frac{4}{5}\frac{4}{5}$ lb. $= \frac{4}{5}\frac{4}{5}$ lb., *Ans.*

Ex. 5. 2 cd. ft. 8 cu. ft. $= 40$ cu. ft.; 1 Cd. $= 128$ cu. ft.;
 $\frac{1}{12}\frac{1}{8}$ Cd. $= \frac{1}{6}$ Cd., *Ans.*

Ex. 6. 1 bbl. 1 gal. 1 qt. 1 pt. 1 gi. $= 1053$ gi.; 1 hhd. $= 2016$ gi.;
 $\frac{1}{2}\frac{1}{2}\frac{1}{2}$ hhd. $= \frac{1}{2}\frac{1}{2}$ hhd., *Ans.*

Ex. 7. 4 yd. $1\frac{1}{2}$ ft. $= 27$ half-feet; 2 rd. $= 66$ half-feet;
 $\frac{3}{4}$ f. $= \frac{3}{2}$, *Ans.*

Ex. 8. $\frac{1\frac{3}{4}}{4}$ bu. $= \frac{8}{20} = \frac{2}{5}$ bu., *Ans.*

Ex. 9. $\frac{2}{3}$ r. $= \frac{1}{3}$, *Ans.*

Ex. 10. 2 yd. 2 qr. $= 10$ qr.; 8 yd. 3 qr. $= 35$ qr.;
 $\frac{1\frac{1}{2}}{3\frac{1}{2}}$ yd. $= \frac{1}{4}$ yd., *Ans.*

(215, page 180.)

Ex. 2. $.217^\circ \times 60 = 13.02'$; $.02' \times 60 = 1.2''$.

Ans. 13' 1.2".

Ex. 3. $.659$ wk. $\times 7 = 4.613$ da.; $.613$ da. $\times 24 = 14.712$ h.;
 $.712$ h. $\times 60 = 42.72$ min.; $.72$ min. $\times 60 = 43.2$ sec.

Ans. 4 da. 14 h. 42 min. 43.2 sec.

Ex. 4. $.578125$ bu. $\times 4 = 2.3125$ pk.; $.3125$ pk. $\times 8 = 2.5$ qt.;
 $.5$ qt. $\times 2 = 1$ pt. *Ans.* 2 pk. 2 qt. 1 pt.

Ex. 5. $.125$ bbl. $\times 31.5 = 3.9375$ gal.; $.9375$ gal. $\times 4 =$
 3.75 qt.; $.75$ qt. $\times 2 = 1.5$ pt.; $.5$ pt. $\times 4 = 2$ gi.

Ans. 3 gal. 3 qt. 1 pt. 2 gi.

Ex. 6. $.628125$ £ $\times 20 = 12.5625$ s.; $.5625$ s. $\times 12 = 6.75$ d.;
 $.75$ d. $\times 4 = 3$ far. *Ans.* 12 s. 6 d. 3 far.

Ex. 7. $.22$ hhd. $\times 63 = 13.86$ gal.; $.86$ gal. $\times 4 = 3.44$ qt.,
 $.44$ qt. $\times 2 = .88$ pt.; $.88$ pt. $\times 4 = 3.52$ gi.

Ans. 13 gal. 3 qt. 3.52 gi.

Ex. 8. $.67$ lea. $\times 3 = 2.01$ mi.; $.01$ mi. $\times 8 = .08$ fur.;
 $.08$ fur. $\times 40 = 3.2$ rd.; $.2$ rd. $\times 5.5 = 1.1$ yd.;
 $.1$ yd. $\times 3 = .3$ ft.; $.3$ ft. $\times 12 = 3.6$ in. $= 3\frac{3}{4}$ in.

Ans. 2 mi. 3 rd. 1 yd. $3\frac{3}{4}$ in.

Ex. 9. $.42857$ mo. $\times 30 = 12.8571$ da.; $.8571$ da. $\times 24 =$
 20.5704 h.; $.5704$ h. $\times 60 = 34.224$ min.;
 $.224$ min. $\times 60 = 13.44$ sec.

Ans. 12 da. 20 h. 34 min. $13\frac{1}{2}$ sec.

Ex. 10. .78875 T. $\times 20 = 15.775$ cwt.; .775 cwt. $\times 4 = 3.1$ qr.;
 .1 qr. $\times 28 = 2.8$ lb.; .8 lb. $\times 16 = 12.8$ oz.

Ans. 15 cwt. 3 qr. 2 lb. 12.8 oz.

Ex. 11. .88125 A. $\times 4 = 3.525$ R.; .525 R. $\times 40 = 21$ P.;

Ans. 5 A. 3 R. 21 P.

Ex. 12. .0055 T. $\times 2000 = 11$ lb., *Ans.*

Ex. 13. .034375 bundles $\times 40 = 1.375$ quires; .575 quires \times
 24 = 9 sheets; *Ans.* 1 quire 9 sheets.

(216, page 181.)

Ex. 2.
$$\begin{array}{r|l} 4 & 1.00 \text{ gi.} \\ 2 & 1.250 \text{ pt.} \\ 4 & 3.625 \text{ qt.} \\ \hline \text{Ans.} & .90625 \text{ gal.} \end{array}$$

Ex. 3.
$$\begin{array}{r|l} 24 & 9.000 \text{ gr.} \\ 20 & 13.375 \text{ pwt.} \\ 12 & 10.66875 \text{ oz.} \\ \hline \text{Ans.} & .8890625 \text{ lb} \end{array}$$

Ex. 4.
$$\begin{array}{r|l} 2 & 1.2 \text{ pt.} \\ 4 & .6 \text{ qt.} \\ 63 & .150 \text{ gal.} \\ \hline \text{Ans.} & .00238 + \text{hhd.} \end{array}$$

Ex. 5.
$$\begin{array}{r|l} 8 & 1.12 \text{ qt.} \\ 4 & 3.14 \text{ pk.} \\ \hline \text{Ans.} & .785 \text{ bu.} \end{array}$$

Ex. 6.
$$\begin{array}{r|l} 40 & 12.56 \text{ P.} \\ 4 & 3.314 \text{ R.} \\ \hline \text{Ans.} & .8285 \text{ A.} \end{array}$$

Ex. 7.
$$\begin{array}{r|l} 12 & 6 \text{ in.} \\ 3 & 1.5 \text{ ft.} \\ 5.5 & 17.5 \text{ yd.} \\ 40 & 3.1818 \text{ } 81 + \text{ rd.} \\ 8 & .0795 \text{ } 545 + \text{ fur} \\ \hline \text{Ans.} & .0099 \text{ } 375 + \text{ mi.} \end{array}$$

Ex. 8. .32 pt. $\div 64 = .005$ bu., *Ans.*

Ex. 9. 4.875 ft. $\div 6 = .8125$ fathoms, *Ans.*

Ex. 10. 150 sheets $\div 480 = .3125$ Rm., *Ans.*

Ex. 11. 47.04 lb. $\div 196 = .24$ bbl flour, *Ans.*

Ex. 12. .33 ft. $\div 5280 = .0000625$ mi., *Ans.*

ADDITION.

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$$\begin{array}{r|l}
 \text{Ex. 13. } 60 & 57.6 \text{ sec.} \\
 60 & 36.96 \text{ min.} \\
 24 & 5.616 \text{ h.} \\
 \hline
 & \text{Ans. } .234 \text{ da.}
 \end{array}$$



ADDITION.

(217, page 183.)

- Ex. 3. 43 10. 1 3 2 \supset 16 gr., *Ans.*
 Ex. 5. 68 bu. 3 pk. 1 qt. 1 pt., *Ans.*
 Ex. 6. 21 mi. 5 fur. 23 rd. 1 yd. 4 in., *Ans.*
 Ex. 10. 627 hbd. 7 gal. 1 qt. 1 pt., *Ans.*
 Ex. 11. 187 bu. 3 pk. 1 pt., *Ans.*
 Ex. 16. 152 cu. yd. 9 cu. ft. = $152\frac{1}{2}$ cu. yd. } *Ans.*
 $\$.16 \times 152\frac{1}{2}$ = $\$24.37\frac{1}{2}$. }
 Ex. 17. 2564 lbs.
 2713 "
 3000 "
 3109 "

 11386 lbs $\div 56 = 203.3214 +$ bu.
 $\$.80 \times 203.3214 = \$162.657 +$, *Ans.*

- bbls. gal. qt. pt. gi.
 Ex. 18. 1 4 0 1 0
 30 2 0 1
 2 15 0 0 0

 3 49 2 1 1 = 4613 gi.
 $\$.09 \times 4613 = \415.17 , *Ans.*

(218, page 185.)

- Ex. 2 $\frac{1}{4}$ rd. = 12 ft. $4\frac{1}{2}$ in.
 $\frac{1}{2}$ ft. = 9 "

 13 ft. $1\frac{1}{2}$ in., *Ans.*

Ex. 3. $\frac{1}{8}$ mi. = 7 fur.
 $\frac{2}{3}$ fur. = 26 rd. 11 ft.
 $\frac{5}{8}$ rd. = 13 " 9 in.

 7 fur. 27 rd. $7\frac{1}{2}$ ft. 9 in.; or
 7 fur. 27 rd. 8 ft. 3 in., *Ans.*

Ex. 4. $\frac{2}{3}$ £ = 13 s. 4 d.
 $\frac{5}{6}$ s. = 6 " $2\frac{2}{3}$ far.

 13 s. 10 d. $2\frac{2}{3}$ far., *Ans.*

Ex. 5. $\frac{2}{3}$ T. = 12 cwt.
 $\frac{2}{3}$ cwt. = 42 lb. $13\frac{1}{4}$ oz.

 12 cwt. 42 lb. $13\frac{1}{4}$ oz., *Ans.*

Ex. 6. $\frac{2}{3}$ da. = 9 h.
 $\frac{1}{2}$ h. = 30 min.

 9 h. 30 min., *Ans.*

Ex. 7. $\frac{1}{8}$ wk. = 1 da. 4 h.
 $\frac{2}{3}$ da. = 18 "
 $\frac{1}{4}$ h. = 15 min.

 1 da. 22 h. 15 min., *Ans.*

Ex. 8. $\frac{2}{3}$ hhd. = 54 gal.
 $\frac{2}{3}$ gal. = 3 qt.

 54 gal. 3 qt., *Ans.*

Ex. 9. $\frac{4}{7}$ cwt. = 64 lb.
 $8\frac{1}{2}$ lb. = 8 " 13 oz. $5\frac{1}{2}$ dr.
 $3\frac{9}{16}$ oz. = 3 " $14\frac{2}{3}$ "

 73 lb. 1 oz. $3\frac{1}{3}$ dr., *Ans.*

Ex. 10. $\frac{2}{3}$ mi. = 3 fur.
 $\frac{2}{3}$ yd. = 2 ft.
 $\frac{2}{4}$ ft. = 9 in.

 3 fur. 2 ft. 9 in., *Ans.*

Ex. 11. $\frac{1}{2}$ of $\frac{1}{2}$ A. = $\frac{1}{4}$ A. = 26 P. 181 $\frac{1}{2}$ sq. ft.
 $60\frac{3}{4}$ rd. = 1 R. 20 " 204 $\frac{2}{17}$ "
 $\frac{4}{7}$ A. = 1 " 5 " 194 $\frac{13}{28}$ "
 $\frac{1}{12}$ A. = 13 " 90 $\frac{3}{4}$ "

3 R. 26 P. 126 $\frac{45}{112}$ sq. ft., *Ans.*

Ex. 12. $1\frac{1}{2}$ T. = 1 T. 3 cwt. 33 lb. 5 $\frac{1}{2}$ oz.
 $1\frac{3}{8}$ T. = 1 " 3 " 75 "
 $18\frac{1}{2}$ cwt. = . 18 " 83 " 5 $\frac{1}{2}$ "

3 T. 5 cwt. 91 lb. 10 $\frac{1}{2}$ oz., *Ans.*

SUBTRACTION.

(219, page 187.)

Ex 4. 3 T. 18 cwt. 70 $\frac{1}{2}$ lb., *Ans.*

Ex. 6. 2953 £ 2 s. 7 $\frac{3}{4}$ d., *Ans.*

Ex. 11. 365 da. $\times 5 + 2$ da. = 1827 da.
1 hhd. = 63 gal.
1827 gi. = 57 " 0 qt. 0 pt. 3 gi.

5 gal. 3 qt. 1 pt. 1 gi., *Ans.*

Ex. 12. 196 A. 2 R. 16.25 P.
200 " 1 " 20 "
177 " 0 " 36 "

1st, 2d, and 3d own 574 A. 0 R. 32.25 P.
640 "

4th owns 65 A. 3 R. 7.75 P., *Ans.*

Ex. 13. 16 Cd. 5 cd. ft. 75 Cd. 6 cd. ft.
24 " 6 " 12 cu. ft. 69 " 2 " 12 cu. ft.
27 " 7 "

6 Cd. 3 cd. ft. 4 cu. ft.
69 Cd. 2 cd. ft. 12 cu. ft. *Ans.*

<p>Ex. 14. 10 gal. 1 qt. 1 pt. 15 " 1 pt. 14 " 3 " <hr style="width: 100%;"/> 40 gal. 1 qt., <i>Ans.</i></p>	<p>63 gal. 40 " 1 qt. <hr style="width: 100%;"/> 22 gal. 3 qt., <i>Ans.</i></p>
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(220, page 189.)

yr. mo. da.	yr. mo. da.
Ex. 2. 1799 12 14	Ex. 5. 1815 6 18
1732 2 22	1775 6 17
<hr style="width: 100%;"/>	<hr style="width: 100%;"/>
67 9 22, <i>Ans.</i>	40 0 1, <i>Ans.</i>

yr. mo. da. h. min.
Ex. 6. 1861 1 3 8 50
1856 6 24 14 20
<hr style="width: 100%;"/>
4 6 8 18 30, <i>Ans.</i>

Ex. 7. 122 da.; 244 da.; 306 da., *Ans.*

Ex. 8. From Nov. 6 to April 6, 151 da.
 From Apr. 6 to Apr. 15, 9 "

 160 da., *Ans.*

Ex. 9. From Aug. 20 to June 20, 304 da.
 Subtract 5 "

 299 da., *Ans.*

(221, page 190.)

Ex. 2. $\frac{1}{4}$ rd. = 8 ft. 3 in.
 $\frac{3}{4}$ ft. = 9 "

 7 ft. 6 in., *Ans.*

Ex. 3. $\frac{4}{9}$ £ = 11 s. 1 d. $1\frac{1}{3}$ far.
 $\frac{1}{2}$ s. = 6 "

 10 s. 7 d. $1\frac{1}{3}$ far., *Ans.*

- Ex. 4. $\frac{2}{3}$ lea. = 2 mi.
 $\frac{7}{10}$ mi. = 5 fur. 24 rd.
 1 mi. 2 fur. 16 rd., *Ans.*
- Ex. 5. $8\frac{2}{3}$ cwt. = 8 cwt. 3 qr. 16 lb. 12 oz. $12\frac{1}{2}$ dr
 1 qr. $2\frac{3}{4}$ lb. = 1 qr. 2 " 6 " $13\frac{1}{4}$ "
Ans. 8 cwt. 2 qr. 14 lb. 5 oz. $15\frac{3}{8}$ dr
- Ex. 6. $\frac{1}{2}$ wk. = 1 da. 9 h. 36 min.
 $\frac{1}{2}$ da. = 4 " 48 "
 1 da. 4 h. 48 min., *Ans.*
- Ex. 7. $\frac{2}{3} + \frac{2}{3} = \frac{4}{3}$; $1 - \frac{4}{3} = \frac{2}{3}$;
 $\frac{2}{3}$ of 120 mi. = 41 mi. 7 fur. 9 rd. 8 ft. $7\frac{1}{4}$ in., *Ans*
- Ex. 8. $1 - \frac{1}{2} = \frac{1}{2}$; $\frac{1}{2}$ of $\frac{1}{2} = \frac{1}{4}$;
 $\frac{1}{4}$ of 96 gal. = 25 gal. 2 qt. $3\frac{1}{2}$ gi., *Ans*

MULTIPLICATION.

(222, page 192.)

- Ex. 4. *Ans.* 23 £ 13 s. 4 d.
 Ex. 5. *Ans.* 23 lb. 4 oz. 6 pwt. 10 gr.
 Ex. 6. *Ans.* 163 T. 1 cwt. 36 lb. 4 oz.
 Ex. 7. *Ans.* $128^{\circ} 35' 15''$.
 Ex. 9. *Ans.* 20 lb $1\frac{2}{3}$ 3 3 1 \supset 16 gr.
 Ex. 10. *Ans.* 235 mi. 6 fur. 7 rd. $4\frac{1}{2}$ ft.

	bu.	pk.	qt.	pt.
Ex. 13	45	3	6	1
				8
	367	2	4	
			8	
	2941,	<i>Ans</i>		

	£	s.	d.
Ex. 14.	1	9	$8\frac{1}{2}$
			12
	17	16	6
			10
	178	5,	<i>Ans.</i>

Ex. 15. $\$4800 \div \$80 = 60 = 6 \times 10$.

A.	R.	P.	sq. yd.	sq. ft.
4	3	26	20	3
				6
<hr/>				
29	2	0	1	
			10	
<hr/>				
295			10,	Ans.

Ex. 17. *Ans.* $359^{\circ} 45' 40.45''$. Ex. 18. *Ans.* 6 hhd.

DIVISION.

(223, page 194.)

Ex. 7. *Ans.* 1 oz. 17 pwt. 4 gr.

Ex. 11. $5 \text{ £ } 10 \text{ s. } 10 \text{ d.} = 1330 \text{ d.};$
 $537 \text{ £ } 10 \text{ s. } 10 \text{ d.} = 129010 \text{ d.}$
 $129010 \div 1330 = 97, \text{ Ans.}$

Ex. 12. $\frac{50 \times 30 \times 6}{27 \times 5 \times 6} = 11 \text{ cu. yd. } 3 \text{ cu. ft., Ans.}$

Ex. 13. $\frac{5 \times 5 \times 640}{150} = 106\frac{2}{3} \text{ A.}$

106 A. 2 R. 26 P. 20 sq. yd. 1 sq. ft. 72 sq. in., *Ans.*

Ex. 14. $4 \text{ bu. } 3 \text{ pk. } 2 \text{ qt.} = 154 \text{ qt.};$
 $336 \text{ bu. } 3 \text{ pk. } 4 \text{ qt.} = 10780 \text{ qt.}$
 $10780 \div 154 = 70, \text{ Ans.}$

Ex. 15. $60 \text{ yd. } 2.25 \text{ qr.} = 242.25 \text{ qr.}; 242.25 \text{ qr.} \times 4 =$
 $969 \text{ qr.}; \frac{2}{3} \text{ of } 969 \text{ qr.} = 646 \text{ qr.}; 9 \text{ yd. } 2 \text{ qr.} = 38 \text{ qr.};$
 $646 \div 38 = 17, \text{ Ans.}$

LONGITUDE AND TIME.

(225, page 196.)

$$\begin{array}{r} \text{Ex. 2. } 84^{\circ} \quad 24' \\ \quad 74 \quad 1 \\ \hline \quad 10^{\circ} \quad 23' \\ \quad \quad 4 \end{array}$$

41 min. 32 sec., *Ans.*

$$\begin{array}{r} \text{Ex. 3. } 155^{\circ} \\ \quad 18 \quad 28' \\ \hline \quad 173^{\circ} \quad 28' \\ \quad \quad 4 \end{array}$$

11 h. 33 min. 52 sec., *Ans.*

$$\begin{array}{r} \text{Ex. 4. } 77^{\circ} \quad 1' \\ \quad 30 \quad 19 \\ \hline \quad 107^{\circ} \quad 20' \\ \quad \quad 4 \end{array}$$

7 h. 9 min. 20 sec., *Ans.*

$$\begin{array}{l} \text{Ex. 5. } 118^{\circ} + 122^{\circ} = 240^{\circ}; \\ \quad 360^{\circ} - 240^{\circ} = 120^{\circ}; \\ \quad 120^{\circ} \div 15 = 8 \text{ h., } \textit{Ans.} \end{array}$$

$$\begin{array}{r} \text{Ex. 6.} \quad 12 \text{ h.} \\ \quad 77^{\circ} 1' = 5 \text{ " } 8 \text{ min. } 4 \text{ sec.} \end{array}$$

6 h. 51 min. 56 sec., A. M., *Ans.*

$$\begin{array}{r} \text{Ex. 7. } 90^{\circ} 15' \\ \quad 63 \quad 36 \\ \hline \quad 26^{\circ} 39' = \end{array}$$

4 h.

1 h. 46 min. 36 sec.

2 h. 13 min. 24 sec., P. M., *Ans.*

$$\text{Ex. 8. } 124^{\circ} - 67^{\circ} = 57^{\circ} = 3 \text{ h. } 48 \text{ min., } \textit{Ans.}$$

$$\begin{array}{r} \text{Ex. 9. } 99^{\circ} \quad 5 \\ \quad 68 \quad 47 \\ \hline \end{array}$$

$30^{\circ} 18' = 2 \text{ h. } 1 \text{ min. } 12 \text{ sec. difference of time.}$

Time at Bangor, 1859 yr. 1 mo. 1 da. 1 h. 0 min. 0 sec. A. M.

Subtract 2 h. 1 min. 12 sec.

Time at Mexico, 1858 yr. 12 mo. 31 da. 10 h. 58 min. 48 sec. P. M.

Ans.

NOTE. In the above subtraction, borrow 31 days, the month being December.

(226, page 197.)

Ex. 2. 11 h. 33 min. 52 sec. = 693 min. 52 sec.;
 (693 min. 52 sec.) \div 4 = $173^{\circ} 28'$, *Ans.*

Ex. 3. 7 h. 9 min. 20 sec. = 429 min. 20 sec.;
 (429 min. 20 sec.) \div 4 = $107^{\circ} 20'$, *Ans.*

Ex. 4. 16 h. 30 min. at St. Petersburg;
 8 h. 32 min. 36 sec. at New Orleans;

 7 h. 57 min. 24 sec. = 477 min. 24 sec.
 (477 min. 24 sec.) \div 4 = $119^{\circ} 21'$, *Ans.*

Ex. 5. $74^{\circ} 1'$ West; 8 h. 40 min. = 130°
 4 h. = 60° $74^{\circ} 1'$ West,

 1st *Ans.* $14^{\circ} 1'$ West. 2d *Ans.* $55^{\circ} 59'$ East.
 13 h. 25 min. = $201^{\circ} 15'$
 $74^{\circ} 1'$ West,

 3d *Ans.* $127^{\circ} 14'$ East.

DUODECIMALS.

MULTIPLICATION.

(229, page 200.)

Ex. 2. 13 ft 9'
 11'

 12 ft. 7' 3'', *Ans.*

Ex. 3. 11 ft. 9'
 1 3'

 2 11' 3''
 11 9

 14 ft. 8' 3''
 4

 58 ft. 9', *Ans.*

Ex. 4. 12 ft. 11' 4 <hr style="width: 100px; margin-left: 0;"/> 51 ft. 8' length of walls; 9 ft. 3' <hr style="width: 100px; margin-left: 0;"/> 12 11 465 <hr style="width: 100px; margin-left: 0;"/> 477 ft. 11' area of walls; 43 ft. 2' <hr style="width: 100px; margin-left: 0;"/> 434 ft. 9' = 48 sq. yd. 2 sq. ft. 9', <i>Ans.</i>	6 ft. 2' 2 ft. 4' <hr style="width: 100px; margin-left: 0;"/> 2 0' 8" 12 4' <hr style="width: 100px; margin-left: 0;"/> 14 ft. 4' 8" 3 <hr style="width: 100px; margin-left: 0;"/> 43 ft. 2', windows and door; <hr style="width: 100px; margin-left: 0;"/>
--	--

Ex. 5 30 ft. 4'
 25 ft. 6'

 15 2
 758 4

 773 ft. 6'
 12 ft. 5'

 322 3 6"
 9282

 9604 ft. 3' 6", *Ans.*

Ex. 6. 18 ft. 6'
 12 ft.

 222 ft.
 5 ft. 6'

 111
 1110

 1221 ft.
 1221 cu. ft. ÷ 128 =
 9 Cd. 69 cu. ft., *Ans.*

Ex. 7. 36 ft. 10'
 22 ft. 3'

 9 2 6
 810 4

 819 ft. 6' 6"
 5 ft. 2'

 136 7 1
 4097 8 6

 4234 ft. 3' 7";
 156 cu. yd. 22 cu. ft. 3' 7", *Ans.*

Ex. 8. 32 ft. 8
 9 ft.

 294 sq. ft.
 294 sq. ft. ÷ 9 = 32 $\frac{2}{3}$ sq. yd
 $\$.17 \times 32\frac{2}{3} = \$5.55\frac{1}{3}$, *Ans*

Ex. 9. $\begin{array}{r} 33 \text{ ft. } 9' \\ 48 \text{ ft.} \\ \hline 36 \\ 1584 \\ \hline 1620 \text{ ft.} = 180 \text{ sq. yd.} \end{array}$

$\frac{27'}{12 \times 3} = \frac{3}{4} \text{ yd.}$

$180 \div \frac{3}{4} = 240 \text{ yd., Ans.}$

DIVISION.

(230, page 201.)

Ex. 2. $16 \text{ ft. } 8' \overline{) 44 \text{ ft. } 5' \quad 4''} (2 \text{ ft. } 8', \text{ Ans.}$

$$\begin{array}{r} 33 \quad 4 \\ \hline 11 \quad 1 \quad 4 \\ 11 \quad 1 \quad 4 \\ \hline \end{array}$$

Ex. 3. $40 \text{ ft. } 11' \quad 4'' \overline{) 184 \text{ ft. } 3' \quad 0''} (4 \text{ ft. } 6', \text{ Ans.}$

$$\begin{array}{r} 163 \quad 9 \quad 4 \\ \hline 20 \quad 5 \quad 8 \\ 20 \quad 5 \quad 8 \\ \hline \end{array}$$

Ex. 4. $2 \text{ ft. } 7' \overline{) 14 \text{ ft. } 6' \quad (5 \text{ ft. } 7' \quad 4'' +, \text{ Ans.}$

$$\begin{array}{r} 12 \quad 11 \\ \hline 1 \quad 7 \quad 0'' \\ 1 \quad 6 \quad 1 \\ \hline 11 \quad 0''' \\ 10 \quad 4 \\ \hline 8''', \text{ rem.} \end{array}$$

Ex. 5. $3 \text{ ft. } 7' \quad 8 \text{ ft. } 11' 6'' \quad 64 \text{ ft. } 2' 5'' (7 \text{ ft. } 2', \text{ Ans}$

2 ft. 6'		62 8 6
7 2		1 5 11
1 9 6		1 5 11
8 ft. 11' 6''		

PROMISCUOUS EXAMPLES.

(Page 202.)

Ex. 1. $115200 \text{ gr.} \div 5760 = 20 \text{ lb.}, \text{ Ans.}$

Ex. 3. $1560 \text{ bu.} \times 4 = 6240 \text{ pk.}; 3 \text{ bu. } 1 \text{ pk.} = 13 \text{ pk.},$
 $6240 \div 13 = 480, \text{ Ans.}$

Ex. 4. $295218 \text{ in.} \div 12 = 24601\frac{1}{2} \text{ ft.}; 24601\frac{1}{2} \text{ ft.} \div 16\frac{1}{2} =$
 $1491 \text{ rd.}; 1491 \text{ rd.} \div 40 = 37 \text{ fur. } 11 \text{ rd.};$
 $37 \text{ fur.} \div 8 = 4 \text{ mi. } 5 \text{ fur.}$
Ans. 4 mi. 5 fur. 11 rd.

Ex. 6. $3 \times 20 \times 24 = 1440, \text{ Ans.}$

Ex. 7. $\frac{\$3.25 \times 4 \times 20 \times 6 \times 10}{128} = \$121.87\frac{1}{2}, \text{ Ans.}$

Ex. 8. $1 \text{ bbl.} = 1008 \text{ gi.}; 1 \text{ qt. } 1 \text{ gi.} = 9 \text{ gi.};$
 $1008 \div 9 = 112, \text{ Ans.}$

Ex. 9. $\$26.40 \times \frac{3}{4} \times \frac{2}{3} = \$980.10, \text{ Ans.}$

Ex. 11. $336 \text{ bu. } 3 \text{ pk. } 4 \text{ qt.} = 10780 \text{ qt.}; 4 \text{ bu. } 3 \text{ pk. } 2 \text{ qt.} =$
 $154 \text{ qt.}; 10780 \div 154 = 70, \text{ Ans.}$

Ex. 12. 3 qt. 1 pt., *Ans.*

Ex. 13. $1 \text{ mi.} = 1760 \text{ yd.}; 2 \text{ fur. } 36 \text{ rd. } 2 \text{ yd.} = 640 \text{ yd.};$
 $1\frac{4}{5} \text{ mi.} = 1\frac{4}{5} \text{ mi.}, \text{ Ans.}$

Ex. 14. 2 da.=172800 sec.; 13 h. 26 min. 24 sec.=
48384 sec.; $\frac{48384}{172800} = \frac{7}{25}$, *Ans.*

Ex. 15. 26 A. 2 R.=106 R.; 5 A. 3 R.=23 R.,
106 R.-23 R.=83 R.; $\frac{83}{100}$, *Ans.*

Ex. 16. $\frac{3}{5}$ £=12 s.

$$\begin{array}{r} 5\frac{1}{4} \text{ d.} \\ \hline \text{Ans. 11 s. } 6\frac{3}{4} \text{ d.} \end{array}$$

Ex. 17. $\frac{1}{4}$ yd.=5 $\frac{1}{4}$ in.
 $\frac{1}{4}$ ft. =1 $\frac{1}{4}$ "
 $\frac{1}{4}$ in. = $\frac{1}{4}$ "

7 in., *Ans.*

Ex. 19. 1732 yr. 2 mo. 22 da.
1706 " 1 " 18 "

26 " 1 mo. 4 da.

Ex. 20. 87° 30'
71° 4' 12 h.

16° 26' = 1 h. 5 min. 44 sec.

10 h. 54 min. 16 sec., A. M., *Ans.*

Ex. 22. $\frac{2}{3}$ mi.=5 fur. 13 rd. 5 ft. 6 in.
 $\frac{1}{2}$ fur.= 20 "
 $\frac{3}{16}$ rd.= 2 " 9 "

5 fur. 33 rd. 8 ft. 3 in., *Ans.*

Ex. 23 20 bu. 3 pk. 6 qt.=20.9375 bu.;
\$.80 \times 20.9375=\$16.75, *Ans.*

Ex. 24. .875 gross \times 12=10.5=10 $\frac{1}{2}$ doz., *Ans.*

Ex. 25. 56.5 \times 24.6=1389.9 P.=8 A. 2 R. 29.9 P., *Ans.*

Ex. 26. 20 + (1 $\frac{1}{2}$ \times 2)=23 ft., length of one side;
23 \times 8 \times 1 $\frac{1}{2}$ \times 4=1104 cu. ft., by the mason's rule;
(see note 5, page 166).
1104 \div 24.75=44.6 + Pch., *Ans.*

Ex. 27. 640 bu. 3 pk. produce of the farm.
 160 " 0 " 6 qt., $\frac{1}{4}$ for the rent.

 480 bu. 2 pk. 2 qt. to be shared among A, B, and C.
 170 " 2 " 6 " A's share.

 309 bu. 3 pk. 4 qt. left for B and C.
 147 " 3 " 6 " B's share.

 161 bu. 3 pk. 6 qt., C's share, *Ans.*

Ex. 28. 13 lb. 8 oz. 11.4 dr. = 13.54453125 lb. Troy.
 13.54453125 lb. $\times \frac{17\frac{1}{4}}{144}$ = 16.46036783 + lb. Av. =
 16 lb. 5 oz. 10 pwt. 11.7 + gr., *Ans.*

Ex. 29. 154 bu. 1 pk. 6 qt. = 154.4375 bu.

$$\frac{\$173.74 \times 1.5}{154.4375} = \frac{\$173.74 \times .3}{30.8875} = \$1.687 +, \text{ } Ans.$$

Ex. 30. .0125 T. $\times 2000$ = 25 lb., *Ans.*

Ex. 31. $\frac{7}{12}$ of 2 bu. 3 pk. = $1\frac{7}{12}$ pk.; 3 bu. = 12 pk.;
 $\frac{7}{12} \div 12 = \frac{7}{144}, \text{ } Ans.$

Ex. 32. $\frac{1}{4} \times \frac{1}{2} \times \frac{2}{3} \times \frac{1728}{1} \times \frac{1}{251} = \frac{1228}{111} = 174\frac{6}{11}, \text{ } Ans.$

Ex. 33. $\frac{15}{2} \times \frac{15}{2} \times \frac{29}{3} \times \frac{1728}{1} \times \frac{1}{2156.4} = \frac{3375}{11.2} = 301.339 +, \text{ } Ans$

Ex. 34.
$$\frac{\$.26 \times 36 \times 20}{9} = \$20.80, \text{ } Ans.$$

Ex. 35.
$$\frac{46 \times 20 \times 2 \times 144}{4 \times 5} = 13248, \text{ } Ans.$$

Ex. 36. 1864 yr. 4 mo. 20 da. 18 h. 30 min
 1836 " 9 " 4 " 3 " 45 "

 27 vr. 7 mo. 16 da. 14 h. 45 min.

Ex. 37. 28 ft. 9' = $28\frac{3}{4}$ ft.; 22 ft. 8' = $22\frac{2}{3}$ ft.; 7 ft. 6' = $7\frac{1}{2}$ ft.
 $\frac{1\frac{1}{4}}{4} \times \frac{2\frac{2}{3}}{3} \times \frac{1\frac{1}{2}}{2} \times \frac{1}{27} = \frac{277\frac{1}{2}}{54} = 181\frac{1}{54}$ cu. yd., *Ans.*

Ex. 38. 30 bu. 54 lb. = 30.9 bu.
 $\$1.375 \times 30.9 = \42.4875 , *Ans.*

Ex. 39. 24 ft. 8' = $24\frac{2}{3}$ ft.; 18 ft. 6' = $18\frac{1}{2}$ ft.;
 $\frac{7\frac{1}{3}}{3} \times \frac{37}{2} \times \frac{1}{6} = \frac{1369}{27} = 50\frac{19}{27}$, *Ans.*

Ex. 40. 54 bu. 8 lb. = $54\frac{1}{6}$ bu.
 $\$.84 \times 54\frac{1}{6} = \45.50 , *Ans.*

Ex. 41. $18720 \div 120 = 156$, *Ans.*

Ex. 42. $\frac{21 \times 5280 \times 12}{30} = 44352$, *Ans.*

Ex. 43. $90^\circ = 324000''$; $3^\circ 12' = 192''$;
 $324000 \div 192 = 1687\frac{1}{2}$ min. =
 1 da. 4 h. 7 min. 30 sec., *Ans.*

Ex. 44. 65 mi. = 65×63360 in.; 9 ft. 2 in. = 110 in.;
 $\frac{65 \times 63360}{110} = 65 \times 576 = 37440$, *Ans.*

Ex. 45. 10 bu. $\times 2150.4 = 21504$ cu. in.
 $21504 \div 57\frac{3}{4} = \frac{21504 \times 4}{231} = \frac{4096}{11} = 372\frac{4}{11}$ qts.
 $\$.22 \times 372\frac{4}{11} = \81.92 sold for;
 $\$5 \times 10 = \50.00 cost.
 $\$31.92$ gain, *Ans.*

Ex. 46 $\frac{240 \times 6 \times 3 \times 1728}{8 \times 4 \times 2} = 116640$ bricks;
 $\$3.25 \times 116.64 = \379.08 , *Ans.*

PERCENTAGE.

(234, page 206.)

Ex. 1	.03	Ex. 2.	.0625	Ex. 3.	.0025
	.06		.0875		.0075
	.09		.3333 +		.00666 +
	.14		.075		.008
	.24		.104		.00625
	.40		.09625		.0125
	1.125		1.035		.028
	1.50		2.25		.04333 +
					.0575
					.07125
					.122
					.25375

Ex. 4. $\frac{3}{5}$; $\frac{2}{3}$; $\frac{3}{4}$; $\frac{29}{100}$; $\frac{147}{1000}$; $\frac{188}{1000}$; $\frac{1}{8}$; $\frac{1}{2}$;
 $\frac{188}{1000}$; $\frac{2}{3}$; $\frac{1}{4}$.

(235, page 207.)

Ex. 9. *Ans.* 63 sheep.Ex. 10. *Ans.* 620 men.Ex. 12. *Ans.* \$22692.25.Ex. 20 $1.00 - .25 = .75$; 760 sheep $\times .75 = 570$ sheep, *Ans*Ex. 21. $.18 + .30 = .48$; $1.00 - .48 = .52$; $\$24500 \times .52 = \12740 , *Ans.*Ex. 22 1576 barrels $\times .125 = 197$ barrels, *Ans.*Ex. 23. $.75 = \frac{3}{4}$; $.33\frac{1}{3} = \frac{1}{3}$; $\frac{3}{4} - \frac{1}{3} = \frac{5}{12}$; $\$2760 \times \frac{5}{12} = \1150 , *Ans.*Ex. 24. $\frac{1}{2} \times \frac{35}{100} = \frac{7}{20}$ sold; $\frac{1}{2} - \frac{7}{20} = \frac{13}{20}$ left, *Ans.*

Ex. 37. 28 ft. 9' = $28\frac{3}{4}$ ft.; 22 ft. 8' = $22\frac{2}{3}$ ft.; 7 ft. 6' = $7\frac{1}{2}$ ft.
 $1\frac{1}{4} \times \frac{2}{3} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{6}$ = $\frac{277}{6}$ = $181\frac{1}{6}$ cu. yd., *Ans.*

Ex. 38. 30 bu. 54 lb. = 30.9 bu.
 $\$1.375 \times 30.9 = \42.4875 , *Ans.*

Ex. 39. 24 ft. 8' = $24\frac{2}{3}$ ft.; 18 ft. 6' = $18\frac{1}{2}$ ft.;
 $\frac{7}{8} \times \frac{3}{4} \times \frac{1}{2} = \frac{13}{64}$ = $50\frac{1}{2}$, *Ans.*

Ex. 40. 54 bu. 8 lb. = $54\frac{1}{6}$ bu.
 $\$.84 \times 54\frac{1}{6} = \45.50 , *Ans.*

Ex. 41. $18720 \div 120 = 156$, *Ans.*

Ex. 42. $\frac{21 \times 5280 \times 12}{30} = 44352$, *Ans.*

Ex. 43. $90^\circ = 324000''$; $3' 12'' = 192''$;
 $324000 \div 192 = 1687\frac{1}{2}$ min. =
 1 da. 4 h. 7 min. 30 sec., *Ans.*

Ex. 44. 65 mi. = 65×63360 in.; 9 ft. 2 in. = 110 in.;
 $\frac{65 \times 63360}{110} = 65 \times 576 = 37440$, *Ans.*

Ex. 45. 10 bu. $\times 2150.4 = 21504$ cu. in.
 $21504 \div 57\frac{3}{4} = \frac{21504 \times 4}{231} = \frac{4096}{11} = 372\frac{4}{11}$ qts.
 $\$.22 \times 372\frac{4}{11} = \81.92 sold for;
 $\$5 \times 10 = \50.00 cost.
 $\$31.92$ gain, *Ans.*

Ex. 46. $\frac{240 \times 6 \times 3 \times 1728}{8 \times 4 \times 2} = 116640$ bricks;
 $\$.325 \times 116.64 = \379.08 , *Ans.*

PERCENTAGE.

(234, page 206.)

Ex. 1	.03	Ex. 2.	.0625	Ex. 3.	.0025
	.06		.0875		.0075
	.09		.3333 +		.00666 +
	.14		.075		.008
	.24		.104		.00625
	.40		.09625		.0125
	1.125		1.035		.028
	1.50		2.25		.04333 +
					.0575
					.07125
					.122
					.25375

Ex. 4. $\frac{3}{8}$; $\frac{2}{3}$; $\frac{3}{4}$; $\frac{29}{100}$; $\frac{147}{100}$; $\frac{133}{100}$; $\frac{1}{6}$; $\frac{3}{4}$;
 $\frac{133}{100}$; $\frac{2}{3}$; $\frac{3}{4}$.

(235, page 207.)

- Ex. 9. *Ans.* 63 sheep. Ex. 10. *Ans.* 620 men.
 Ex. 12. *Ans.* \$22692.25.
 Ex. 20. $1.00 - .25 = .75$; $760 \text{ sheep} \times .75 = 570 \text{ sheep}$, *Ans.*
 Ex. 21. $.18 + .30 = .48$; $1.00 - .48 = .52$;
 $\$24500 \times .52 = \12740 , *Ans.*
 Ex. 22. $1576 \text{ barrels} \times .125 = 197 \text{ barrels}$, *Ans.*
 Ex. 23. $.75 = \frac{3}{4}$; $.33\frac{1}{3} = \frac{1}{3}$; $\frac{3}{4} - \frac{1}{3} = \frac{5}{12}$;
 $\$2760 \times \frac{5}{12} = \1150 , *Ans.*
 Ex. 24. $\frac{1}{2} \times \frac{35}{100} = \frac{7}{20}$ sold; $\frac{1}{2} - \frac{7}{20} = \frac{13}{20}$ left, *Ans.*

- Ex. 25. $\frac{3}{5}$, owed after the 1st payment.
 $\frac{3}{5} \times \frac{3}{4}$, " " " 2d "
 $\frac{3}{5} \times \frac{3}{4} \times \frac{7}{8}$, " " " 3d "
 ~~$\frac{3}{5} \times \frac{3}{4} \times \frac{7}{8} \times \frac{3}{4} \times \frac{3}{4} \times \frac{7}{8}$~~ $\times \frac{3}{5} \times \frac{3}{4} \times \frac{7}{8} = \$226.56\frac{2}{3}$, *Ans.*

(236, page 208.)

- Ex. 2. $90 \div 450 = .20 = 20$ per cent., *Ans.*
 Ex. 3. $175 \div 1400 = .125 = 12\frac{1}{2}$ per cent., *Ans.*
 Ex. 4. $165 \div 750 = .22 = 22$ per cent., *Ans.*
 Ex. 5. $13.20 \div 240 = .055 = 5\frac{1}{2}$ per cent., *Ans.*
 Ex. 6. $.15 \div 2 = .075 = 7\frac{1}{2}$ per cent., *Ans.*
 Ex. 7. 6 bu. 1 pk. = 200 qt.; 4 bu. 2 pk. 6 qt. = 150 qt.
 $150 \div 200 = .75 = 75$ per cent., *Ans.*
 Ex. 8. 15 lb. = 240 oz.; 5 lb. 10 oz. = 90 oz.;
 $90 \div 240 = .375 = 37\frac{1}{2}$ per cent., *Ans.*
 Ex. 9. $40 \div 250 = .16 = 16$ per cent., *Ans.*
 Ex. 10. $100 + 90 = 190$;
 $190 \div 760 = .25 = 25$ per cent., *Ans.*
 Ex. 11. $\frac{2}{3}$ of $\frac{3}{4} = \frac{1}{2} = .50 = 50$ per cent., *Ans.*

(237, page 209)

- Ex. 2. $16 \div .08 = 200$, *Ans.*
 Ex. 3. $42 \div .07 = 600$, *Ans.*
 Ex. 4. $75 \div .125 = 600$, *Ans.*
 Ex. 5. $33 \div .0275 = 1200$, *Ans.*
 Ex. 6. $\$281.25 \div .375 = \750 , *Ans.*
 Ex. 7. $50 \div .20 = 250$, *Ans.*
 Ex. 8. $\$59.75 \div .125 = \478 , *Ans.*
 Ex. 9. $\$975 \div .15 = \6500 , *Ans.*
 Ex. 10. $.40 \times .25 = .1$
 $\$1246.50 \div .1 = \12465 , *Ans.*
 Ex. 11. $2000 \div .40 = 5000$; $5000 - 2000 = 3000$, *Ans.*

(238, page 211.)

- Ex. 2. $1.00 + .18 = 1.18$; $1475 \div 1.18 = 1250$, *Ans.*
 Ex. 3. $1.00 + .25 = 1.25$; $\$4.00 \div 1.25 = \3.20 , *Ans.*
 Ex. 4. $1.00 + .15 = 1.15$; $\$6900 \div 1.15 = \6000 , *Ans.*
 Ex. 5. $1.00 + .08\frac{1}{8} = 1.08\frac{1}{8}$;
 $\$432250 \div 1.080625 = \400000 , *Ans.*
 Ex. 6. $1.00 + .04\frac{1}{4} = 1.0425$;
 $\$8757 \div 1.0425 = \8400 , *Ans.*
 Ex. 7. Since he increased his capital the first year by 20 % of itself he must have had 100 % + 20 %, or 120 % of original capital for new capital the second year; and since he increased his new capital by 20 % he must have had 120 % of 120 %, that is, 144 %, of original capital; therefore $\$9360 \div 1.44 = \6500 , *Ans.*

(239, page 212.)

- Ex. 2. $1.00 - .15 = .85$; $340 \div .85 = 400$, *Ans.*
 Ex. 3. $1.00 - .20 = .80$; $\$1000 \div .80 = \1250 , *Ans.*
 Ex. 4. $1.00 - .24 = .76$; $\$4028 \div .76 = \5300 , *Ans.*
 Ex. 5. $1.00 - .00\frac{1}{2} = .995$; $298\frac{1}{2} \div .995 = 300$, *Ans.*
 Ex. 6. $\$198$, his selling price, is 90 % of his asking price; therefore $\$198 \div .90 = \220 , his asking price; and $\$220$, his asking price, is 110 % of the cost; therefore $\$220 \div 1.10 = \200 cost, *Ans.*

COMMISSION AND BROKERAGE.

(243, page 213.)

- Ex. 2. $\$6756 \times .02 = \135.12 , *Ans.*
 • Ex. 3. $\$17380 \times .035 = \608.30 , *Ans.*

Ex. 4. $\$.75 \times 4700 = \3525 ; $\$3525 \times .015 = \52.875 , *Ans.*

Ex. 5. $\$25875 \times .0075 = \64.6875 , *Ans.*

Ex. 6. $\$3284 + \$2176.50 = \$5460.50$;
 $\$5460.50 \times .0225 = \$122.86 +$, *Ans.*

Ex. 7. $\$2890 \times \frac{4}{500} = \23.12 , *Ans.*

Ex. 8. $\$.32 \times 26750 = \8560 ;
 $\$8560 \times .02\frac{3}{4} = \235.40 , *Ans.*

Ex. 9. $400 \times 570 \times \$.09 \times .0225 = \461.70 , *Ans.*

Ex. 10. $\$.760 \times 450 = \3420
 $.25 \times 56 \times 38 = 532$
 $.09 \times 48 \times 105 = 453.60$

 $\$4405.60 \times .055 = \242.308 , *Ans.*

Ex. 11. $\$950 \times .06\frac{1}{2} = \61.75 , fee; $\$950 - \61.75
 $= \$888.25$, remitted.

Ex. 12. $\$30456.50 \times .06 = \1827.39
 19814.15

 $\$10642.35 \times .04 = 425.694$

 $\$2253.084$, *Ans.*

(244, page 215.)

Ex. 2. $\$3246.20 \div 1.02 = \3182.55 (nearly) invested;
 $\$3246.20 - \$3182.55 = \$63.65$, *Ans.*

Ex. 3. $\$9682 \div 1.03 = \9400 , *Ans.*

Ex. 4. $\$10246.50 \div 1.035 = \9900 invested;
 $\$9900 \div \$5.50 = 1800$, *Ans.*

Ex. 5. $\$4908 \div 1.045 = \$4695.69 +$, *Ans.*

Ex. 6. $\$603.75 \div 1.05 = \575 invested;
 $\$575 \div \$5 = 115$, *Ans.*

Ex. 7. $.03 + .015 = .045$
 $\$9376.158 \div 1.045 = \8972.40 , to pay out;
 $\$9376.158 - \$8972.40 = \$403.758$, fees, *Ans.*

- Ex. 8. $\$13842.07 \div 1.0175 = \13604 , invested ;
 $\$13842.07 - \$13604 = \$238.07$, commission, *Ans.*
- Ex. 9. $\$10650 \div 1.0025 = \10623.44 + , *Ans.*

STOCKS.

(261, page 218.)

- Ex. 2. $\$1200 \times .95 = \1140 , *Ans.*
- Ex. 3. $\$3500 \times .85 = \2975 , *Ans.*
- Ex. 4. $\$1.00 + \$.05\frac{1}{2} + \$.00\frac{1}{2} = \1.06 , cost of doll. of stock ;
 $\$150 \times 48 = \7200 , nominal amount ;
 $\$1.06 \times 7200 = \7632 , *Ans.*
- Ex. 5. $\$1.09\frac{1}{8} \times 5364 = \5853.465 , *Ans.*
- Ex. 6. $\$6275 \times .12 = \753 , *Ans.*
- Ex. 7. $1.00 + .04\frac{3}{4} + .00\frac{1}{4} = 1.05$;
 $\$25000 \times 1.05 = \131250 , *Ans.*
- Ex. 8. $.14 + .125 = .265$, rate of gain ;
 $\$4200 \times .265 = \1113 , *Ans.*
- Ex. 9. $\$17500 \times 1.0075 = \17631.25 , *Ans.*
- Ex. 10. $.03 + .0225 = .0525$, rate of gain ;
 $\$50 \times 75 = \3750 , nominal amount of stock ;
 $\$3750 \times .0525 = \196.875 , *Ans.*
- Ex. 11. $\$50 \times 28 = \1400 ; $\$1400 \times 1.07 = \1498 ;
 $\$100 \times 25 = \2500 ; $\$2500 \times .875 = \2187.50 ;
 $\$2187.50 - \$1498 = \$689.50$, *Ans.*
- Ex. 12. $\$3600 \times .95 = \3420 ;
 $\$2700 \times 1.03 = \2781 ; $\$3420 - \$2781 = \$639$, *Ans.*
- Ex. 13. $\$12000 \times .145 = \1740 , *Ans.*

(262, page 219.)

- Ex. 2. $\$6300 = 1.05 = \$6000 = 60$ shares, *Ans.*
- Ex. 3. $\$6187.50 \div .90 = \6875 , *Ans.*

Ex. 4. $\$53500 \div 1.07 = \50000 , *Ans.*

Ex. 5. $\$1150 \div .92 = \1250 , nominal amount;
 $\$1250 \div 50 = \25 , *Ans.*

(265, page 222.)

Ex. 2. $\$867 \div 1.02 = \850 , stock purchased;
 $\$850 \times .06 = \51 , income, *Ans.*

Ex. 3. $\$8428 \div .98 = \8600 , stock purchased;
 $\$8600 \times .05 = \430 , income, *Ans.*

Ex. 4. $1.04\frac{3}{4} + .00\frac{1}{4} = 1.05$;
 $\$10500 \div 1.05 = \10000 , *Ans.*

Ex. 5. $.87 + .00\frac{1}{2} = .875$;
 $\$4795 \div .875 = \5480 , stock purchased;
 $\$5480 \times .05 = \274 , income, *Ans.*

Ex. 6. $1.07\frac{1}{2} + .00\frac{1}{2} = 1.08$; $.96\frac{1}{2} + .00\frac{1}{2} = .97$;
 $\$10476 \div 1.08 = \9700 , purchase of 6's ;
 $\$10476 \div .97 = \10800 , " " 5-20's ;
 $\$9700 \times .06 = \582 , income from 6's ;
 $\$10800 \times .05 = \540 , " " 5-20's ;

 $\$42$, *Ans.*

Ex. 7. $1.08\frac{3}{4} + .00\frac{1}{4} = 1.09$;
 $\$125 \times 109 = \13625 ;
 $\$13625 \div 1.09 = \12500 , stock purchased ;
 $\$12500 \times .06 = \750 , income from stock ;
 $\$750 - \$681.25 = \$68.75$, income increased, *Ans*

(266, page 223.)

Ex. 2. $\$840 \div .06 = \14000 , stock required ;
 $\$14000 \times .95 = \13300 , investment, *Ans.*

Ex. 3. $\$1860 \div .05 = \37200 , stock required.
 $\$37200 \times .98\frac{1}{2} = \36642 , investment, *Ans.*

Ex. 4. $\$1080 \div .05 = \21600 , stock required ;
 $\$21600 \times 1.08\frac{1}{2} = \23436 , investment, *Ans.*

- Ex. 5. $\$25000 \times .93\frac{3}{4} = \23437.50 , proceeds of 5-20's ;
 $\$960 \div .06 = \16000 , 6's required ;
 $\$16000 \times 1.09\frac{1}{4} = \17480 , investment in U. S. 6's ;
 $\$23437.50 - \$17480 = \$5957.50$, cost of house, *Ans.*

(267, page 223.)

- Ex. 2. $.06 \div .87 = .06\frac{2}{3} = 6\frac{2}{3} \%$, *Ans.*
 Ex. 3. $.06 \div 1.05 = .05\frac{2}{7} = 5\frac{2}{7} \%$, *Ans.*
 Ex. 4. $.06 \div .75 = .08 = 8 \%$, *Ans.*
 Ex. 5. $.06 \div 1.08 = .05\frac{5}{9} = 5\frac{5}{9} \%$, *Ans.*
 Ex. 6. $.05 \div .985 = .05\frac{1}{197} = 5\frac{1}{197} \%$;
 $.06 \div 1.09 = .05\frac{5}{109} = 5\frac{5}{109} \%$, better, *Ans.*

(268, page 224.)

- Ex. 2. $.06 \div .09 = .66\frac{2}{3} = 66\frac{2}{3} \%$, *Ans.*
 Ex. 3. $.06 \div .05 = 1.20$;
 $1.20 - 1.00 = .20 = 20 \%$ premium, *Ans.*
 Ex. 4. $.05 \div .06 = .83\frac{1}{3} = 83\frac{1}{3} \%$, *Ans.*
 Ex. 5. $.05 \div .07 = .71\frac{3}{7}$;
 $1.00 - .71\frac{3}{7} = .28\frac{4}{7} = 28\frac{4}{7} \%$, *Ans.*

GOLD INVESTMENTS.

(270, page 225.)

- Ex. 2. $\$1.47 \times 150 = \367.50 , *Ans.*
 Ex. 3. $\$1.37\frac{1}{2} \times 320.50 = \$440.68\frac{3}{4}$, *Ans.*
 Ex. 4. $\$1.33 \times 2500 = \3325 , *Ans.*
 Ex. 5. $\$8000 \times .05 = \400 , income in gold ;
 $\$1.38 \times 400 = \552 , " " currency, *Ans.*
 Ex. 6. $\$9500 \times .06 = \570 , income in gold ;
 $\$1.40 \times 570 = \798 , " " currency, *Ans.*

- Ex. 7. $\$1.475 \times 3000 = \4425 , cost of house in currency
by latter offer;
 $\$4500 - \$4425 = \$75$, gain, *Ans.*

271, page 226.)

- Ex. 2. $\$1.00 \div \$1.38\frac{1}{2} = \$72\frac{56}{277}$, *Ans.*
- Ex. 3. $\$1.00 \div \$1.45 = .68\frac{28}{99}$;
 $1.00 - .68\frac{28}{99} = .31\frac{1}{99} = 31\frac{1}{99} \%$, *Ans.* to first.
 $\$1.00 \div \$1.47 = .68\frac{4}{47}$;
 $1.00 - .68\frac{4}{47} = .31\frac{143}{147} = 31\frac{143}{147} \%$, *Ans.* to second.
 $\$1.00 \div \$1.955 = .51\frac{59}{91}$;
 $1.00 - .51\frac{59}{91} = .48\frac{32}{91} = 48\frac{32}{91} \%$, *Ans.* to third.
 $\$1.00 \div \$2.85 = .35\frac{2}{7}$;
 $1.00 - .35\frac{2}{7} = .64\frac{2}{7} = 64\frac{2}{7} \%$, *Ans.* to fourth.
- Ex. 4. $\$4181 \div \$1.48 = \$2825$, *Ans.*
- Ex. 5. $\$.24 \div \$1.60 = \$.15$, *Ans.*
- Ex. 6. $\$5900 \times .90 = \5310 , proceeds of sale of 10-40's;
 $\$5310 \div \$1.47\frac{1}{2} = \$3600$, gold purchased, *Ans.*
- Ex. 7. $\$1.00 \div \$1.45 = .68\frac{28}{99}$, *Ans.*
- Ex. 8. $\$792 \div \$1.65 = \$480$, *Ans.*
- Ex. 9. $\$1.00 \div \$.30 = 3.33\frac{1}{3} = 333\frac{1}{3} \%$, *Ans.* to first.
 $\$1.00 \div \$.45 = 2.22\frac{2}{9} = 222\frac{2}{9} \%$, " " second.
 $\$1.00 \div \$.54 = 1.85\frac{5}{27} = 185\frac{5}{27} \%$, " " third.
 $\$1.00 \div \$.60 = 1.66\frac{2}{3} = 166\frac{2}{3} \%$, " " fourth.
 $\$1.00 \div \$.74 = 1.35\frac{5}{37} = 135\frac{5}{37} \%$, " " fifth.
- Ex. 10. $\$126 \div \$1.40 = \$90$, value of currency in gold;
 $\$90 \div \$3.50 = 25\frac{2}{7}$ yards, *Ans.*
- Ex. 11. $\$11.75 \div \$1.50 = \$7.83\frac{1}{3}$, purch. price of flour, gold;
 $\$10.35 \div \$1.35 = \$7.66\frac{2}{3}$, selling " " " "
 $\$7.83\frac{1}{3} - \$7.66\frac{2}{3} = \$.16\frac{2}{3}$, loss in gold on one barrel;
 $\$.16\frac{2}{3} \times 300 = \50 , entire loss, *Ans.*

Ex 12. $\$.07 \div \$1.40 = .05 = 5\%$, rate of income in gold from mortgage;
 $.06 - .05 = 1\%$, 5-20's better, *Ans.*

Ex. 13. $\$51100 \times .073 = \3730.30 , inc. from 7.30's in cur.;
 $\$3730.30 \div \$1.46 = \$2555$, " " 7.30's in gold;
 $\$51100 \times 1.04 = \53144 , proceeds of 7.30's;
 $\$53144 \div \$1.46 = \$36400$, gold purchased;
 $\$36400 \div \$.70 = \$52000$, 10-40's purchased;
 $\$52000 \times .05 = \2600 , inc. from 10-40's in gold;
 $\$2600 - \$2555 = \$45$, income increased, *Ans.*

PROFIT AND LOSS.

(273, page 228.)

Ex. 2. $\$84.80 \times .125 = \10.60 , *Ans.*

Ex. 3. $\$1.15 \times 500 = \575 , cost of wheat;
 $\$575 \times .16\frac{2}{3} = \$95.83\frac{1}{3}$, *Ans.*

Ex. 4. $\$3.625 \times 76 = \275.50 , cost of wood;
 $\$275.50 \times .26 = \71.63 , *Ans.*

Ex. 5. $\$1.75 \times 40 = \70 , cost; $\$70 \times .14\frac{2}{7} = \10 , *Ans.*

Ex. 6. $\$.0825 \times 230 \times 3 = \56.925 , cost; $.18\frac{2}{11} = \frac{2}{11}$;
 $\$56.925 \times \frac{2}{11} = \10.35 , gain;
 $\$56.925 + \$10.35 = \$67.275$; $230 \text{ lb.} \times 3 = 690 \text{ lbs.}$
 $\$67.275 \div 690 = \$.0975$, selling price, *Ans.*

Ex. 7. $\$.625 \times 3840 \times .375 = \900 , *Ans.*
 Or $\$.625 = \frac{5}{8}$; $.375 = \frac{3}{8}$; $3840 \times \frac{5}{8} \times \frac{3}{8} = \900 , *Ans.*

Ex. 8. $\$4720 \times .125 = \590 , loss in the bargain;
 $\$4720 - \$590 = \$4130$; $\$4130 \times .15 = \619.50 loss in bad debts
 $\$590 + \$619.50 = \$1209.50$, *Ans.*

Ex. 9. $1 + .225 = 1.225$, his per cent. after 1 year;
 $1.225 \times 1.30 = 1.5925$, his per cent. after 2 years;
 $1.5925 \times \frac{4}{5} = 1.3270\frac{1}{5}$, his per cent. after 3 years
 $\$3000 \times .3270\frac{1}{5} = \981.25 , *Ans.*

(274, page 229.)

Ex. 2. $\$330 - \$275 = \$55$, gain;
 $\$55 \div \$275 = .20$, *Ans.*

Ex. 3. $\$.75 - \$.60 = \$.15$, gain;
 $\$.15 \div \$.60 = .25$, *Ans.*

Ex. 4. $\frac{\$114.885}{108 \times \$4.625} = .23$, *Ans.*

Ex. 5. $\$.095 - \$.08 = \$.015$, gain on 1 lb.,
 $\$.015 \div \$.08 = .1875 = 18\frac{3}{4}$ per cent., *Ans.*

Ex. 6. $\$42 \times 150 = \6300 ; $\$6300 - \$5400 = \$900$.
 $\$900 \div \$6300 = .14\frac{2}{7}$, *Ans.*

Ex. 7. $\$25 - \$15 = \$10$; $\$10 \div \$25 = .40$, *Ans.*

Ex. 8. $\$.25 \times 20 = \5.00 , received per ream;
 $\$5.00 - \$2.00 = \$3.00$, gain per ream;
 $\$3.00 \div \$2.00 = 1.50 = 150$ per cent., *Ans.*

Ex. 9. If $\frac{1}{2}$ sells for $\frac{3}{4}$ its cost, 1 sells for $\frac{4}{2} = \frac{3}{1}$ its cost
 $\frac{3}{1} - \frac{1}{1} = \frac{2}{1}$, gain on 1, $= .50 = 50$ per cent., *Ans.*

Ex. 10. $\frac{1}{2} \div \frac{4}{5} = \frac{5}{8}$; or the whole would be sold for $\frac{5}{8}$ of its
cost; hence $\frac{3}{8}$ of the cost was lost. And,
 $\frac{3}{8} = 37\frac{1}{2}$ per cent., *Ans.*

Ex. 11. One peck is gained on 3 pecks; hence
 $1 \div 3 = .33\frac{1}{3}$ per cent., *Ans.*

Ex. 12. $87\frac{1}{2}$ per cent., *Ans.*

Ex. 13. $342 \text{ lb. @ } \$0.08 = \27.36

$378 \text{ lb. @ } .08\frac{1}{2} = 32.13$

$\$59.49$ sold for ;

$720 \text{ lb.} \times .07 = 50.40$ cost ;

$\$9.09$ gain ;

$\$9.09 \div \$50.40 = .18\frac{1}{2}\frac{1}{8}$ per cent., *Ans.*

Ex. 14. $\$1.60 - \$1.25 = \$.35$, gain per gal. ;

$\$.35 \div \$1.25 = .28$, gain per cent. ;

$\$1.25 \times 63 \times 2 \times .28 = \44.10 , whole gain, *Ans.*

Ex. 15. $\$.66 - \$.55 = \$.11$, gain per bushel on the corn ;

$\$.11 \div \$.55 = .20$, gain per cent. on the corn.

$\$1.375 - \$1.10 = \$.275$, gain per bushel on the wheat ;

$\$.275 \div \$1.10 = .25$, gain per cent. on the wheat ;

$.25 - .20 = .05$ per cent. on the wheat, *Ans.*

(275, page 231.)

Ex. 2. $\frac{\$140 \times 1.25}{1250} = \$.14$, *Ans.*

Ex. 3. $\$.30 \times 1.16\frac{2}{3} \times 1.33\frac{1}{3} = \$.46\frac{2}{3}$, *Ans.*

Ex. 4. $\$.105 \times 1.17\frac{1}{3} = \$.1232$, *Ans.*

Ex. 5. $1.00 - .15 = .85$

$\$.62\frac{1}{2} \times .85 = \$.53\frac{1}{8}$
 $1.20 \times .85 = 1.02$
 $3.875 \times .85 = 3.29\frac{3}{8}$ } *Ans.*

Ex. 6. $\$3240 \times .82 = \2656.80 , *Ans.*

Ex. 7. $\$28 \times 120 = \3360 ; $\$3360 + \$480 = \$3840$, whole cost ; $\$3840 \times 1.12\frac{1}{2} = \4320 ; $\$4320 - \$3840 = \$480$, gain ;

$\$4320 \div 120 = \36 , an acre, *Ans.*

Ex. 8. $\$2.60 \times 52 = \135.20 ; $\$135.20 \times 1\frac{2}{3} = \185.90 ;

$52 - 7 = 45$; $\$185.90 \div 45 = \$4.13\frac{1}{3}$, *Ans.*

Ex. 9. $1.18\frac{3}{4} = 1\frac{15}{8}$; $23\frac{1}{3} = 7\frac{2}{3}$;
 $\$2\frac{1}{2} \times 1\frac{15}{8} \times 1\frac{1}{2} \times 7\frac{2}{3} = \2.85 , *Ans.*

(276, page 232.)

Ex. 2. $\$.08 \div .80 = \$.10$, *Ans.*

Ex. 3. $\$6.125 \div .875 = \7.00 , *Ans.*

Ex. 4. $\$.96 \div 1.28 = \$.75$, *Ans.*

Ex. 5. $1.18\frac{3}{4} = 1\frac{15}{8}$; $\$1881 \div 1\frac{15}{8} = \1584 , *Ans.*

Ex. 6. $\frac{\$69.75}{1.24 \times 25} = \2.25 , *Ans.*

Ex. 7. $\$2\frac{1}{4} \times 4\frac{1}{5} \times 1\frac{1}{8} = \86.25 , *Ans.*

Ex. 8. $\$96 \div 80 = \120 , cost;
 $\$120 \times 1.15 = \138 , *Ans.*

Ex. 9. $1.125 = 1\frac{1}{8}$; $1.18\frac{3}{4} = 1\frac{15}{8}$;
 $\$570 \times 1\frac{1}{8} \times \frac{8}{9} = \$426.66\frac{2}{3}$, *Ans.*

Ex. 10. $\$24 \times 4 = \96 whole, proceeds.
 $\$24 \times 2 = \48 ; $\$48 \div 1.20 = \40 , cost of 1st 2 bbl.
 $\$48 \div .80 = \60 , cost of 2d 2 bbl.
 $\$40 + \$60 = \$100$; $\$100 - \$96 = \$4$, lost.

Ex. 11. $\$4900 \div 1.40 = \$3500 = 3$ times what he began with;
and $\$3500 \div 3 = \$1166.66\frac{2}{3}$, *Ans.*

INSURANCE

(282, page 234.)

Ex. 2. $\$750 \times .04 = \30 , *Ans.*

Ex. 3. $\$4572.80 \times .025 = \114.32 , *Ans.*

Ex. 4. $\$5700 \times .0175 = \99.75 , *Ans.*

Ex. 5. $\$28400 \times .035 = \994 , *Ans.*

Ex. 6. $\$55800 \times .028 = \1562.40 , premium;
 $\$55800 - \$1562.40 = \$54237.60$, *Ans.*

Ex. 7. $\$47500 \times \frac{3}{400} = \356.25 , *Ans.*

Ex. 8. $\$8000 + \$4000 = \$12000$;
 $\$12000 \times .02\frac{2}{3} = \285 , *Ans.*

Ex. 9. $\$1.20 \times 4000 = \4800 , worth of wheat;
 $\$4800 \times \frac{2}{3} = \3200 , amount insured for;
 $\$3200 \times \frac{3}{4} \times \frac{3}{200} = \36 , premium;
 $\$3200 - \$36 = \$3164$, saved by insuring;
 $\$4800 - \$3164 = \$1636$, owner's loss, *Ans.*

Ex. 10. $\$21000 \times \frac{4}{500} = \168 ;
 $\$15400 \times \frac{5}{800} = \96.25 ;
 $\$168 + \$96.25 = \$264.25$, *Ans.*

TAXES.

(289, page 236.)

Ex. 3. Property tax = \$26.95
 1 poll .75

 \$27.70, *Ans.*

Ex. 4. $\$.50 \times 2981 = \1490.50 , poll tax;
 $\$9190.50 - \$1490.50 = \$7700$, property tax;
 $\$7700 \div \$1,400,000 = .0055$, rate of taxation.
 $\$12450 \times .0055 = \68.475
 2 polls = \$ 1.00

 C's tax \$69.475, *Ans.*

Ex. 5. $\$5375 \times .0055 = \29.5625 , *Ans.*

- Ex. 6. $\$.625 \times 30 = \18.75 , poll tax ;
 $\$4342.75 - \$18.75 = \$4324$, property tax ;
 $\$4324 \div \$188000 = .023$, rate of taxation.
 $\$2500 \times .023 + \$.625 = \$58.125$, *Ans.*
- Ex. 7. $\$.30 \times 25482 = \7644.60 , poll tax ;
 $\$103294.60 - \$7644.60 = \$95650$, property tax ;
 $\$95650 \div \$38260000 = .0025$, rate of taxation.
 $\$9470 \times .0025 + \$.90 = \$24.575$, *Ans.*
- Ex. 8. $\$10000 \times 1.025 = \10250 , whole tax ;
 $\$1.25 \times 225 = \281.25 , poll tax ;
 $\$10250 - \$281.25 = \$9968.75$, property tax ;
 $\$9968.75 \div \$1246093.75 = .008$, rate of taxation ;
 $\$11500 \times .008 + \$1.25 = \$93.25$, E's tax, *Ans.*
- Ex. 9 $\$275.57 - \$98 = \$177.57$, tax ;
 $\$177.57 \div 3946 = \$.045$, rate per day ;
 $\$.045 \times 118 \times 2 = \10.62 , *Ans.*

CUSTOM HOUSE BUSINESS.

(303, page 239.)

Ex. 2. $\$.95 \times 224 = \212.80 , value of the silk,
 $\$212.80 \times .19 = \40.432 , *Ans.*

Ex. 3. $\$.54 \times 31.5 \times 50 = \850.50 , gross value;
 deduct $\$850.50 \times .02 = \underline{17.01}$ for leakage;
 $\$833.49$, net value;
 $\$833.49 \times .24 = \200.0376 , *Ans.*

Ex. 4. $\$.15 \times 115 \times 175 = \3018.75 , value of the coffee;
 $\$3018.75 \times .15 = \$452.81\frac{1}{4}$, *Ans.*

Ex. 5. $\$.36 \times 63 \times 25 = \567 , gross value;
 deduct $\$567 \times .005 = \underline{2.835}$, for leakage;
 $\$564.165$, net value;
 $\$564.165 \times .24 = \135.3906 , *Ans.*

PARTIAL PAYMENTS.

(314, page 249.)

Ex. 3. Amt. of note to Nov. 12, 1858, (4 mo. 22 da.)	\$535.27 +
Payment,	105.50
New Principal,	<u>\$429.77 +</u>
Amt., Mar. 20, 1860, (16 mo. 8 da.)	488.03 +
Payment,	200
New Principal,	<u>\$288.03 +</u>
Amt., July 10, 1860, (3 mo. 20 da.)	296.83 +
Payment,	75.60
New Principal,	<u>\$221.23 +</u>
Amt., June 20, 1861, (11 mo. 10 da.)	\$242.12 +,
	<i>Ans</i>

Ex 4. Amt. of note, Jan. 1, 1860, (7 mo. 24 da.)	\$3136.50
Sum of payments to this date,	525.00
New Principal,	<u>\$2611.50</u>
Amt., April 4, 1861, (15 mo. 3 da.)	2841.53 +
Sum of payments,	1575.00
New Principal,	<u>\$1266.53 +</u>
Amt., Feb. 20, 1862, (10 mo. 16 da.)	\$1344.35 +,
	<i>Ans</i>

Ex. 5. Amt. of note, Jan. 1, 1852, (16 mo. 28 da.)	\$977.15 +
Payment,	250.00
New Principal,	<u>\$727.15 -</u>
Amt. May 4, 1853, (16 mo. 3 da.)	775.93 +
Payment,	316.75
New Principal... ..	<u>\$459.18 +</u>
Amt. Sept. 15, 1853, (4 mo. 11 da.)	\$467.53 +.

Ex. 6. Interest commenced Aug. 2, 1860.

Amt. of note, May 6, 1861, (9 mo. 4 da.), \$192.988 +
 Payment, 50

New Principal, \$142.988 +
 Amt. Aug. 26, 1862, (15 mo. 20 da.) \$154.188 +.

Ex. 7. Amt. of mortgage, Jan. 1, 1852, (3 mo.)...\$6120.00

Payment, 500

New Principal, \$5620.00

Amt. Sept. 10, 1852, (8 mo. 9 da.) 5930.98 +
 Payment, 1126.00

New Principal, \$4804.98 +
 Amt. March 31, 1854, (18 mo. 21 da.) ... 5404.00 +
 Payment, 2000.00

New Principal, \$3404.00 +
 Amt. Aug. 10, 1854, (4 mo. 9 da.) 3501.57 +
 Payment, 876.50

New Principal, \$2625.07 +
 Amt. Oct. 1, 1857, (37 mo. 21 da.) \$3284.84 +

(315, page 251.)

Ex. 1. Amt. from Jan. 1, 1858, to Jan. 1, 1859,

(1 yr.) \$487.60

Amt. of 1st pay't from Apr. 16, 1858, to

Jan. 1, 1859, (8 mo. 15 da.) 154.29

New Principal, \$333.31

Amt. from Jan. 1, 1859, to Mar. 11, 1860,

(14 mo. 10 da.) 357.19 +

Payment, 75.00

New Principal, \$282.19 +

Amt. from Mar. 11, 1860, to Dec. 11, 1860, (9 mo.).....	\$294.89 +
Amt. of 3d pay't from Sept. 21, 1860, to Dec. 11, 1860, (2 mo. 20 da.).....	56.74 +
	<u>Ans. \$238.15 +</u>

(316, page 251.)

Ex. 1. Amt. of Principal, Jan. 1, 1859, (2 yr. 8 mo. 20 da.).....	\$698.00
Amt. of 1st endorsement, (for 2 yr. 4 mo. 21 da.).....	\$178.386
Amt. of 2d endorsement, (for 1 yr. 10 mo. 19 da.)	222.633
Amt. of 3d endorsement, (for 7 mo.)	191.475
	<u>592.494</u>
	<u>Ans. \$105.50 +</u>

(317, page 252.)

Ex 1. Amt. of note, Aug. 4, 1859, (1 yr.)	\$609.50
Amt. of 1st pay't, Aug. 4, 1859, (9 mo.)..	66.88
New Principal,.....	<u>\$542.62</u>
Amt. of new Principal, Aug. 4, 1860, (1 yr.)	575.17
Amt. of 2d pay't, Aug. 4, 1860, (7 mo. 21 da.).....	\$49.85
Amt. of 3d pay't, Aug. 4, 1860, (4 mo. 18 da.).....	253.70
	<u>303.55</u>
New Principal,	<u>\$271.62</u>
Amt. of new Prin., Nov. 4, 1860, (3 mo.).	275.69
Amt. of 4th pay't, Nov. 4, 1860, (1 mo. 6 da.)	60.36
	<u>Ans. \$215.33.</u>

(318, page 253.)

Ex. 1.	1st installment of interest, due Feb. 2, 1856,	\$30
2d	" " " " " " 1857,	30
3d	" " " " " " 1858,	30
4th	" " " " " " 1859,	30
5th	" " " " Aug. 2, 1859,	15
		<hr/>
		\$135
	1st installment draws int. 3 yr. 6 mo.	
2d	" " " 2 yr. 6 mo.	
3d	" " " 1 yr. 6 mo.	
4th	" " " 6 mo.	
		<hr/>
	Int. of \$30 for 8 yr. 0 mo.	\$14.40
	Principal,	\$500.00
		<hr/>
	<i>Ans.</i>	\$649.40

PROBLEMS IN INTEREST.

(320, page 253.)

- Ex. 2. Int. of \$1 for 6 yr. 3 mo. at 6 per cent., is \$.395;
 $\$28.125 \div .375 = \75 , *Ans.*
- Ex. 3. Int. of \$1 for 4 mo. 18 da. at 4 per cent., \$.015 $\frac{1}{3}$;
 $\$9.20 \div .015\frac{1}{3} = \600 , *Ans.*
- Ex. 4. $\$1260 \div .07 = \18000 , *Ans.*
- Ex. 5. $\$3370 \div .10 = \33700 , *Ans.*

(321, page 254.)

- Ex. 2. \$1 for 8 mo. at 6 per cent., amounts to \$1.04;
 $\$655.20 \div 1.04 = \630 , *Ans.*
- Ex. 3. Amt. of \$1 for 5 yr. 5 mo. 9 da. at 5 per cent.,
 $1.2720\frac{1}{8}$; $\$106.855 \div 1.2720\frac{1}{8} = \84 , *Ans.*

- Ex. 4. Amt. of \$1 for 8 yr. 5 mo. at $5\frac{1}{2}$ per cent.,
 $\$1.462916 +$;
 $\$1897.545 \div 1.462916 + = \$1297.09 +$, *Ans.*
- Ex. 5. Amt. of \$1 for 3 yr. 4 mo. at 7 per cent., $\$1.23\frac{1}{4}$;
 $\$221.075 \div 1.23\frac{1}{4} = \179.25 , *Ans.*
- Ex. 6. Amt. of \$1 for 11 yr. 8 da. at $10\frac{1}{2}$ per cent., $\$2.157\frac{1}{2}$;
 $\$857.54 \div 2.157\frac{1}{2} = \397.50 , principal ;
 Int. of \$397.50 for 11 yr. 8 da., at $10\frac{1}{2}$ per cent., =
 $\$460.04$, *Ans.*

(322, page 255.)

- Ex. 2. Int. of \$500 for 3 yr. at 1 per cent., \$15 ;
 $\$45 \div \$15 = 3$ per cent., *Ans.*
- Ex. 3. Int. of \$180 for 1 yr. 2 mo. 6 da. at 1 per cent.,
 $\$2.13$; $\$12.78 \div \$2.13 = 6$ per cent., *Ans.*
- Ex. 4. Int. of \$2000 for 6 mo. at 1 per cent., \$10 ;
 $\$75 \div \$10 = 7\frac{1}{2}$ per cent. per annum, *Ans.*
- Ex. 5. Int. of \$1000 for 3 yr. 3 mo. 29 da. at 1 per cent.,
 $\$33.305 +$;
 $\$183.18 \div \$33.305 = 5.5$ per cent., *Ans.*
- Ex. 6. Int. of \$21640 for 1 year at 1 per cent., \$216.40 ;
 $\$2596.80 \div \$216.40 = 12$ per cent., *Ans.*

(323, page 256.)

- Ex. 2. $\$325 \times .06 = \19.50 , int. for 1 yr. ;
 $\$58.50 \div \$19.50 = 3$ yr., *Ans.*
- Ex. 3. $\$1600 \times .06 = \96 ; $\$2000 - \$1600 = \$400$;
 $\$400 \div \$96 = 4\frac{1}{3}$ yr. = 4 yr. 2 mo., *Ans.*
- Ex. 4. $\$204 \times .07 = \14.28 ; $\$217.09 - \$204 = \$13.09$;
 $\$13.09 \div \$14.28 = 1\frac{1}{2}$ yr. = 11 mo., *Ans.*

Ex. 5. $\$750 \times .06 = \45 ; $\$942 - \$750 = \$192$;
 $\$192 \div \$45 = 4\frac{4}{5}$ yr. = 4 yr. 3 mo. 6 da., *Ans.*

Ex. 6. $\$200 \times .06 = \12 ;
 $\$200 \div \$12 = 16\frac{2}{3}$ yr. = 16 yr. 8 mo., *Ans.*

Ex. 7. $\$675 \times .05 = \33.75 ;
 $\$675 \div \$33.75 = 20$ years, *Ans.*

COMPOUND INTEREST.

(324, page 257.)

Ex. 2. $\$500.00$ Prin. for 1st year.
 $\quad 35.00$ Int. " " "

 $\$535.00$ Prin. " 2d "
 $\quad 37.45$ Int. " " "

 $\$572.45$ Amt. " 2 years.
 $\quad 500.$ Given Prin.

Ans. $\$ 72.45$ Compound interest.

Ex. 3. $\$312.00$ Prin. for 1st year.
 $\quad 18.72$ Int. " " "

 $\$330.72$ Prin. " 2d "
 $\quad 19.84$ Int. " " "

 $\$350.56$ Prin. " 3d "
 $\quad 21.03$ Int.

Ans. $\$371.59 +$, Amt. " 3 years.

Ex. 4. \$250.00 Prin. for 1st. half year.

7.50 Int. " " "

\$257.50 Prin. " 2d "

7.72 Int. " " "

\$265.22 Prin. " 3d "

7.96 Int. " " "

\$273.18 Prin. " 4th "

8.19 Int. " " "

\$281.37 Amt " 2 years.

250.00

Ans. \$31.37 + Compound interest.

Ex. 5. \$450.00 Prin. for 1st quarter.

7.87 Int. " " "

\$457.87 Prin. " 2d "

8.01 Int. " " "

\$465.88 Prin. " 3d "

8.15 Int. " " "

\$474.03 Prin. " 4th "

8.30 Int. " " "

Ans. \$482.33 + Amt. " 1 year.

Ex. 6. \$236.00 Prin. for 1st year.

14.16 Int. " " "

\$250.16 Prin. " 2d "

15.01 Int. " " "

\$265.17 Prin. " 3d "

15.91 Int. " " "

\$281.08 Prin. " 4th "

16.86 Int. " " "

\$297.94	Prin. " 7 mo. 6 da.
10.72	Int. " 7 " 6 "
<hr/>	
\$308.66	Amt. " 4 yr. 7 mo. 6 da.
236.00	Given principal.

Ans. \$72.66 + Int. 4 yr. 7 mo. 6 da.

Ex. 7. \$700.00 Prin. for 1st year.

49.00	Int. " " "
<hr/>	
\$749.00	Prin. " 2d "
52.43	Int. " " "
<hr/>	
\$801.43	Prin. " 3d "
56.10	Int. " " "

\$857.53	Prin. " 9 mo. 24 da.
49.02	Int. " 9 " 24 "

Ans. \$906.55 +, Amt. " 4 yr. 9 mo. 24 da.

Ex. 9. $\$120 \times 2.078928 = \$129.47 +$, *Ans.*

Ex. 10. $\$.10 \times 3.86968 = \$.386968$, *Ans.*

DISCOUNT.

(326, page 259.)

Ex. 2. $\$180 \div 1.20 = \150 , *Ans.*

Ex. 3. $\$1315.389 \div 1.175 = \1119.48 , *Ans.*

Ex. 4. $\$866.038 \div 1.281\frac{1}{3} = \$675.888 +$, pres. worth. $\left\{ \begin{array}{l} \text{Ans} \\ \$866.038 - \$675.888 + = \$190.15 +, \text{disc't.} \end{array} \right.$

Ex. 5. $\$1005 - \$475 = \$530$

$\$475 \div 1.05 = \$452.38 +$

$\$530 \div 1.075 = 493.02 +$

$\$945.40 +$, *Ans.*

- Ex. 6. Term of discount, 6 mo. 24 da.
 $\$529.925 \div 1.034 = \512.50 present worth.
 $\$529.925 - \$512.50 = \$17.425$ discount, *Ans.*
- Ex. 7. $\$3675$ cash offer.
 $\$4235 \div 1.21 = \3500 cash value of note.
Ans. \$ 175, loss.
- Ex. 8 $\$550 \div 1.10 = \500 , present value of note ;
 $\$480$, cash offer ;
Ans. \$ 20, gain.
- Ex. 9. $\$517.50 \div 1.035 = \$ 500$
 $\$793.75 \div 1.05\frac{1}{2} = \$ 750$
 $\$1326.47 \div 1.105 = \$1200.426 +$

 $\$2450.426 +$, entire pres. worth
 $\$2637.72 - \$2450.426 + = \$187.29 +$, *Ans.*
- Ex. 10. $\$.10 \times \frac{1}{2} = \$.12$, int. of \$1 for 10 mo. at 10 per cent.
 $\$130 \div 1\frac{1}{2} = \120 ; $\$130 - \$120 = \$10.00$, discount.
 $\$130 \times \frac{1}{1\frac{1}{2}} = \$10.83\frac{1}{3}$, interest.
Ans. \$.83\frac{1}{3}.
-

PROMISCUOUS EXAMPLES IN PERCENTAGE.

(Page 260.)

- Ex. 1. $.02 + .25 = .27$ gain per cent. on cost.
 $\frac{2}{4} \times \frac{1}{8}\frac{7}{8} = \frac{1}{8}\frac{7}{8}$ cents, selling price of what remains
of every pound, after transportation ;
 $\frac{1}{8}\frac{7}{8} \div .95 = \frac{1}{8}\frac{7}{8} \times \frac{1}{.95} = 8\frac{1}{2} +$, *Ans.*
- Ex. 2. $\$200 \times .40 = \80 gain on one ;
 $\$200 \times .20 = \40 loss on the other ;
Ans. \$40.

- Ex. 3. $\$425 \div 1.03 = \$412.62 +$ cash value of sale ;
 $\$425 - \$25 = \$400.00$ cost ;

Ans. $\$12.624$, profit.

- Ex. 4. $\$.13 \div 1.04 = \$.125$; $\$.13 - \$.125 = \$.005$;
 $\$.005 \div \$.125 = .04$, *Ans.*

- Ex. 5. $\$150 \div 1.25 = \120 cost of one ;
 $\$150 \div .75 = 200$ cost of the other ;
 $\$320$ cost of both ;
 $\$320 - \$300 = \$20$, *Ans.*

- Ex. 6. Amt. of \$1 for 2 yr. 8 mo. at 9 per cent., \$1.24 ;
 $\$1 \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \3750 , *Ans.*

- Ex. 7. $1.00 \div .07 = 14\frac{2}{7}$ years, *Ans.*

- Ex. 8. 3 yr. 4 mo. $= 3\frac{1}{3}$ yr. ; $.12\frac{1}{2} \times 3\frac{1}{3} = .41\frac{2}{3}$, whole rate
of gain ; $\$5000 \div .41\frac{2}{3} = \12000 , capital ;
 $\$12000 \times \frac{1}{2} = \7500 , A's, } *Ans.*
 $\$12000 \times \frac{1}{3} = \4500 , B's, }

- Ex. 9. $\$800 \times .15 = \120 , gain on groceries ;
 $500 \times .20 = 100$, loss on dry goods ;
Whole gain $\$20$, *Ans.*

- Ex. 10. $1.00 \div .08\frac{1}{3} = .91\frac{2}{3}$;
 $\$1100 \div .91\frac{2}{3} = \1200 , *Ans.*

- Ex. 11. $\$667 \div 1.04 = \$641.346 +$, cash value of goods ;
 $600 \times 1.06 = 636$. pres. valuation of goods ,
True gain, $\$5.346 +$, *Ans.*

- Ex. 12. $\$18 \times \frac{1}{3} = \6 , profits ; $\$18 - \$6 = \$12$, cost ;
 $\$6 \div 12 = 50$ per cent., profit, *Ans.*

- Ex. 13. If $\frac{1}{3}$ sell for $\frac{1}{3}$ of cost, the whole would sell for $\frac{1}{3} \times \frac{1}{3}$
of the cost, which is $1\frac{1}{3}$ times cost. Hence $\frac{1}{3} = .40\frac{1}{3}$, is the
gain per cent.

Ex. 14. \$1.30, received for lumber originally worth \$1.00;
\$1.06 $\frac{2}{3}$, valuation of ditto, after 16 mo. int. accrues;

\$1.06 $\frac{2}{3}$ gain on \$1.06 $\frac{2}{3}$;

\$1.06 $\frac{2}{3}$ ÷ \$1.06 $\frac{2}{3}$ = .21 $\frac{1}{3}$; *Ans.*

Ex. 15. $1 - \frac{1}{3} = \frac{2}{3}$; $\frac{2}{3} \times \frac{1}{2} = \frac{1}{3}$, *Ans.*

Ex. 16. \$1.12 $\frac{1}{2}$ × 728 = \$819, expended in wheat;
.60 × .30 × .50 = .09; \$819 ÷ .09 = \$9100, in bank;
1.00 - .60 = .40; \$9100 × .40 = \$3640, *Ans.*

Ex. 17. 6 × 5 = 30 sq. yd., area to be covered; 4 per cent.
is $\frac{1}{25}$, and 5 per cent. is $\frac{1}{20}$; hence every yard purchased will
be, after shrinking, $\frac{24}{25}$ of 1 yd. long, and $\frac{19}{20}$ of $\frac{3}{4}$ yd. = $\frac{47}{100}$ yd.
wide, and will contain $\frac{24}{25} \times \frac{47}{100}$ sq. yd. Therefore, as many
yards must be purchased as $\frac{24}{25} \times \frac{47}{100}$ is contained times in 30.
 $\frac{30}{1} \times \frac{24}{25} \times \frac{100}{47} = 43\frac{1}{47}$ yd., *Ans.*

Ex. 18. 1.00 per cent. = B's money;

1.28 " = A's "

.28 ÷ 1.28 = .21 $\frac{1}{8}$, *Ans.*

Ex. 19. \$1200 ÷ .12 = \$10000, $\frac{2}{3}$ of his capital;

\$10000 ÷ $\frac{2}{3}$ = \$25000, whole capital;

\$25000 × $\frac{2}{3}$ × $\frac{1}{168}$ = \$750, loss on $\frac{2}{3}$ of the capital;

\$1200 - \$750 = \$450, gain.

Ex. 20. Amt. of \$1 for 3 yr. 9 mo. at 10 per cent., \$1.375;

\$1933.25 ÷ 1.375 = \$1406 = $\frac{1}{2}$ of C's money.

\$1406 × 2 = \$2812, C's, }
\$2812 × $\frac{2}{3}$ = \$421 $\frac{2}{3}$, D's, } *Ans.*

BANKING.

(336, page 264).

- Ex. 1. Int. of \$450 at 6 per cent., for 63 da. = \$4.725 disc't
 $\$450 - \$4.725 = \$445.275$, proceeds.
- Ex. 2. Int. of \$368 at 7 per cent., for 93 da. = \$6.654 +, disc't;
 $\$368 - \$6.654 + = \$361.345 +$, proceeds, *Ans.*
- Ex. 3. Int. of \$475.50 at 5 per cent., for 63 da. = \$4.16 +,
 discount; $\$475.50 - \$4.16 + = \$471.33 +$, proceeds.
- Ex. 4. Int. of \$10000 at 6 per cent., for 93 da. = \$155, disc't;
 $\$10000 - \$155 = \$9845$, proceeds, *Ans.*
- Ex. 5. Proceeds of the note, disc'ted at 6 per cent., \$247.375;
 $\$247.375 - \$240 = \$7.375$, *Ans.*
- Ex. 6. Int. of \$360.76 at 6 per cent., for 93 da. = \$5.591 +,
 disc't; $\$360.76 - \$5.591 + = \$355.168 +$, proceeds.
- Ex. 7. Proceeds of the note, \$529.2355;
 $\$530 - \$529.2355 = \$7645$, *Ans.*
- Ex. 8. From Mar. 2 to Apr. 7 is 36 da., term of discount;
 Int. of \$500, at 6 per cent., for 36 da., is \$3.00, disc't;
 $\$500 - \$3.00 = \$497$, proceeds.
- Ex. 9. From Nov. 15 to Dec. 15 is 30 da., term of discount;
 Amt. of \$750 on interest for 6 mo. 3 da. at 6 per
 cent. is \$772.875;
 Bank discount of \$772.875 for 30 da., at 10 per cent
 is \$6.440 +; $\$772.875 - \$6.440 + =$
 $\$766.4347$, proceeds.

(351, page 271.)

Ex. 2. $\$243.60 \div 1.015 = \240 , *Ans.*

Ex. 3. $\$79.20 \div .99 = \80 , *Ans.*

Ex. 4. $\$1 - \$.0105 = \$.9895$
 Add $\quad .02$

 $\$1.0095$, draft for \$1;
 $\$282.66 \div 1.0095 = \280 , *Ans.*

Ex. 5. $\$1 - .0055 = \$.9945$
 Subtract $\quad .0125$

 $\$.982$, draft for \$1;
 $\$240 \div .982 = \$244.399 +$, draft bot. for \$240;
 $\$240 - (\$240 \times .005) = 238.80$ current money for \$240;

Ans. $\$ 5.599 +$, saved.

Ex. 6. $\$1.00000$
 $\quad .01225$, bank disc't at 7 per cent. (63 da.,

 $\$.98775$
 $\quad .0075$ premium.

 $\$3600 \div .99525 = \$3617.181 +$, draft required.
 $\$3600 \div 1.0075 = \$3573.200 +$, draft sent.
 Add int. for 60 da. $\$ 35.732 +$ (at 6 per cent.)

 Amt. at time req'd, $\$3608.932 +$
 $\$3617.181 - \$3608.932 = \$8.24 +$, loss, *Ans.*

EQUATION OF PAYMENTS.

(356, page 273.)

Ex. 2. $\$700 \times 20 = \14000

$400 \times 30 = 12000$

$700 \times 40 = 28000$

 $\$1800$

 $\$54000$

$54000 \div 1800 = 30$ da. average credit.

Sept. 25 + 30 da. = Oct. 25, equated time.

Ex. 3. $\$250 \times 4 = \1000

$750 \times 2 = 1500$

$500 \times 7 = 3500$

 $\$1500$

 $\$6000$

$6000 \div 1500 = 4$ mo. average credit.

July 1 + 4 mo. = Nov. 1, *Ans.*

Ex. 4. $\$1 \times 0 = \$ 0$

$2 \times 1 = 2$

$3 \times 2 = 6$

$4 \times 3 = 12$

$5 \times 4 = 20$

$6 \times 5 = 30$

$7 \times 6 = 42$

 $\$28$

 $\$112$

$112 \div 28 = 4$ da.

Monday + 4 da. = Friday, *Ans.*

Ex. 5 $\$650 \times 4 = \2600

$725 \times 8 = 5800$

$500 \times 12 = 6000$

 $\$1875$

 $\$14400$

$14400 \div 1875 = 7.68$ mo. = 7 mo. 20 da.

Jan. 1 + 7 mo. 20 da. = Aug. 21, *Ans.*

(362, page 276.

Ex. 2.

Due.	da.	Items.	Prod.
Jan. 1	0	150	
" 16	15	200	3000
Feb. 4	34	100	3400
March 3	61	160	9760
		610	16160

$$16160 \div 610 = 26 \text{ da.}$$

Jan. 1 + 26 da. = Jan. 27, *Ans.*

Ex. 3.

Due.	da.	Items.	Prod.
March 1		300	
April 4	34	240	8160
Aug. 18	170	100	17000
Aug. 8	160	400	64000
		1040	89160

$$89160 \div 1040 = 86 \text{ da.}$$

March 1 + 86 da. = May 26, *Ans.*

Ex. 4.

Due.	da.	Items.	Prod.
June 1		600	
" 12	11	300	3300
" 15	14	832	11648
" 25	24	760	18240
" 30	29	750	21750
		3242	54938

$$54938 \div 3242 = 17 \text{ da.}$$

June 1 + 17 da. = June 18, *Ans.*

Ex. 5.

Due.	da.	Items.	Prod.
Jan. 16		536.78	
Feb. 20	35	425.36	14887.60
March 4	48	259.25	12444.00
April 24	99	786.36	77849.64
		2007.75	105181.24

Ans. $\left\{ \begin{array}{l} 105181.24 \div 2007.75 = 52 \text{ da.} \\ \text{Jan. 16, 1856} + 52 \text{ da.} = \text{March 8, 1856.} \end{array} \right.$

Ex. 6.

Due.	da.	Items.	Prod.
April 1		420	
" 28	27	135	3645
June 15	75	1800	135000
		2355	138645

Ans. $\left\{ \begin{array}{l} 139650 \div 2355 = 59 \text{ da.} \\ \text{Apr. 1} + 59 \text{ da.} = \text{May 30.} \end{array} \right.$

(363, page 278.)

Dr.

Cr.

Ex. 2.

Due.	da.	Items.	Prod.	Due.	da.	Items.	Prod.
Jan. 1		448		Jan. 20	19	560	10640
Feb. 4	34	364	12376	Feb. 16	46	264	12144
" 20	50	232	11600	" 25	55	900	49500
		1044	23976			1724	72284
						1044	23976
				Balances		680	48308

Ans. $\left\{ \begin{array}{l} 48308 \div 680 = 71 \text{ da.} \\ \text{Jan. 1} + 71 \text{ da.} = \text{March 13} \end{array} \right.$

Ex. 3.

<i>Dr.</i>				<i>Cr.</i>			
Due.	da.	Items.	Prod.	Due.	da.	Items.	Prod.
Apr. 1	0	145.86		May 11	40	11.00	440.00
June 12	72	37.48	2698.56	July 12	102	15.00	1530.00
Sept. 3	155	12.25	1898.75	Oct. 12	194	82.00	15908.00
Oct. 4	186	66.48	12365.28				
		262.07	16962.59			108.00	17878.00
		108.00					16962.55
Bal acct.		154.07		Bal. Prod.			915.41

$$\text{Ans. } \left\{ \begin{array}{l} 915.41 \div 154.07 = 6 \text{ da.} \\ \text{Apr. 1} - 6 \text{ da.} = \text{March 26, 1858.} \end{array} \right.$$

RATIO.

(379, page 281.)

Ex. 2. $\frac{5}{20} = \frac{1}{4}$, Ans.

Ex. 3. $\frac{4}{8} = \frac{1}{2}$, Ans.

Ex. 4. $\frac{4}{7} = 7$, Ans.

Ex. 5. $\frac{8}{16} = 5\frac{1}{2}$, Ans.

Ex. 6. $\frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$, Ans.

Ex. 7. $\frac{7}{1} \times \frac{2}{13} = 12$, Ans.

Ex. 8. $\frac{4}{8} = 4\frac{1}{2}$, Ans.

Ex. 9. $\frac{2}{3} \times \frac{4}{3} = \frac{8}{9}$, Ans.

Ex. 10. $\frac{1}{16} \times \frac{2}{3} = \frac{2}{48}$, Ans.

Ex. 11. $\frac{5}{3} \times \frac{3}{16} = 5$, Ans.

Ex. 12. 3 gal. = 24 pt.; 2 qt. 1 pt. = 5 pt.;

$5 \div 24 = \frac{5}{24}$, Ans.

Ex. 13. 8 s. 6 d. = 8.5 s.; $\frac{8}{5} \times \frac{5}{3} = 13\frac{2}{3}$, Ans.

Ex. 14. $\frac{5}{3} \times \frac{5}{6} = \frac{25}{18}$, Ans.

Ex. 15. 19 lb. 5 oz. 8 pwt. = 4668 pwt.; 25 lbs. 11 oz. 4 pwt. = 6224 pwt.

$\frac{4668}{6224} = 1\frac{1}{2}$, Ans.

Ex. 16. $\frac{1}{2} = \frac{1}{2}$, Ans.

Ex. 17. $\frac{3}{4} \times \frac{4}{3} = \frac{12}{12}$, Ans.

Ex. 18. $\frac{2}{3} \times \frac{3}{4} = \frac{6}{12}$, Ans.

Ex. 19. $16 \div 2\frac{2}{3} = 7$, Ans.

- Ex. 20. $14.5 \times 3 = 43.5$, *Ans.* Ex. 21. $\frac{7}{8} \times \frac{4}{3} = \frac{7}{6} = 1\frac{1}{6}$, *Ans.*
 Ex. 22. $\frac{3}{8} \times \frac{1}{6} = \frac{1}{16}$, *Ans.*
-

PROPORTION.

(388, page 383.)

- Ex. 1. $\frac{48 \times 50}{20} = 120$, *Ans.* Ex. 2. $\frac{70 \times 3}{42} = 5$, *Ans.*
 Ex. 3. $\frac{30 \times 20}{100} = 6$, *Ans.* Ex. 4. $\frac{84}{7} = 12$, *Ans.*
 Ex. 5. $\frac{201.75 \times 48 \text{ yd.}}{67.25} = 144 \text{ yd.}$, *Ans.*
 Ex. 6. 3 lb. 12 oz. = 60 oz.
 $\frac{10.50 \times 60 \text{ oz.}}{3.50} = 180 \text{ oz.} = 11 \text{ lb. } 4 \text{ oz.}$, *Ans.*
 Ex. 7. 8 bu. 2 pk. = 34 pk.; 76 bu. 2 pk. = 306 pk.
 $\frac{\$38.25 \times 34}{306} = \4.25 , *Ans.*
 Ex. 8. $\frac{17}{4} \times \frac{15}{2} \times \frac{1}{1\frac{2}{3}} = \frac{17}{2} = 8\frac{1}{2}$, *Ans.*
 Ex. 9. $\frac{12}{1} \times \frac{3}{4} \times \frac{7}{6} = 7$, *Ans.* Ex. 10. $\frac{5}{8} \times \frac{2}{3} \times \frac{3}{1} = \frac{5}{4}$, *Ans.*
-

SIMPLE PROPORTION.

(399, page 287.)

- Ex. 1. 48 Cd. : 20 Cd. :: \$120 : ()
 () = $\frac{\$120 \times 20}{48} = \50 , *Ans.*
 Or. $\$120 \times \frac{4}{3} = \50 , *Ans.*

Ex. 2. 6 bu. : 75 bu. :: \$4.75 : ()

$$() = \frac{\$4.75 \times 75}{6} = \$59.37\frac{1}{2}, \text{ Ans.}$$

Or, $\$4.75 \times 7\frac{5}{6} = \$59.37\frac{1}{2}, \text{ Ans.}$

Ex. 3. $\$3\frac{1}{2}$: \$50 :: 8 yd. : ()

$$() = \frac{50 \times 8 \text{ yd.}}{3\frac{1}{2}} = 114\frac{2}{3} \text{ yd., Ans.}$$

Ex. 4. 12 : 20 :: 42 bu. : ()

$$() = \frac{42 \text{ bu.} \times 20}{12} = 70 \text{ bu., Ans.}$$

Or, $42 \text{ bu.} \times 1\frac{2}{3} = 70 \text{ bu., Ans.}$

Ex. 5. \$.75 : \$9.00 :: 7 lb. : ()

$$() = \frac{900 \times 7 \text{ lb.}}{75} = 84 \text{ lb., Ans.}$$

Ex. 6. 3 lb. 12 oz. : 11 lb. 4 oz. :: \$3.50 : ()

60 oz. : 180 oz. :: \$3.50 : ()

$$() = \frac{\$3.50 \times 180}{60} = \$10.50, \text{ Ans.}$$

Ex. 7. 1 ft. 6 in. : 75 ft. :: 3 ft. 8 in. : ()

$1\frac{1}{2}$ ft. : 75 ft. :: $3\frac{2}{3}$: ()

$$() = 7\frac{1}{2} \times \frac{11}{3} \text{ ft.} \times \frac{2}{3} = 183\frac{1}{3} \text{ ft.} = 183 \text{ ft. 4 in., Ans.}$$

Ex. 8. $\$2.75 \times 1\frac{3}{4} = \$19.64\frac{3}{4}, \text{ Ans.}$

Ex. 9. \$13.32 : \$51.06 :: 12 bu. : ()

$$() = \frac{51.06 \times 12 \text{ bu.}}{13.32} = 46 \text{ bu., Ans.}$$

Ex. 10. 15 hhd. = 945 gal.

945 gal : 28.5 gal. :: \$236.25 : ()

$$() = \frac{\$236.25 \times 28.5}{945} = 7.12\frac{1}{2}, \text{ Ans.}$$

Ex. 11. 6 mo. : 11 mo. :: 7 bbl. : ()

$$() = \frac{11 \times 7 \text{ bbl.}}{6} = 12\frac{5}{6} \text{ bbl., Ans.}$$

Ex. 12. 5 £ 12 s. : 44 £ 16 s. :: 9 yd. : ()

$$() = \frac{9 \text{ yd.} \times 896}{112} = 72 \text{ yd., Ans.}$$

Ex. 13. \$3100 $\times \frac{759}{7580} = \310 , Ans.

Ex. 14. 100 lbs. coffee = 100 $\times \frac{2}{3} = 160$ lbs. sugar;

2 : 160 :: \$.25 : ()

$$() = \frac{.25 \times 160}{2} = \$20, \text{ Ans.}$$

Ex. 15. 13° 10' 35" : 360° :: 1 da. : ()

47435" : 1296000" :: 1 da. : ()

$$() = \frac{1296000 \times 47435}{47435} \text{ da.} = 27 \text{ da. 7 h. 43 min. 6.06} + \text{ sec., Ans.}$$

Ex. 16. 8 $\frac{3}{4}$: 13 $\frac{1}{2}$:: \$4.20 : ()

$$() = \$4.20 \times \frac{27}{2} \times \frac{4}{35} = \$6.48, \text{ Ans.}$$

Ex. 17. 6 $\frac{1}{4}$ d. : 10 £ 6 s. 8 d. :: 1 $\frac{3}{4}$ yd. : ()

$$() = 24\frac{3}{4} \times \frac{7}{4} \text{ yd.} \times \frac{4}{25} = 694\frac{3}{5} \text{ yds., Ans.}$$

Ex. 18. 12 $\frac{1}{2}$ cwt. : 48 $\frac{3}{8}$ cwt. :: \$42 $\frac{1}{4}$: ()

$$() = \$14\frac{1}{2} \times \frac{227}{25} = \$163.50 +, \text{ Ans.}$$

Ex. 19. \$1 $\frac{3}{4}$: \$317.23 :: 8 $\frac{3}{8}$ lb. : ()

$$() = 317.23 \times 8.4 \text{ lb.} \times \frac{4}{7} = 1522.7 + \text{ lb.} = 15 \text{ cwt. 22.7} + \text{ lb., Ans.}$$

Ex. 20. \$156 $\frac{1}{4}$: \$95.75 :: 15 $\frac{5}{8}$ bu. : ()

$$() = 25\frac{75}{4} \times \frac{125}{8} \text{ bu.} = 9.575 \text{ bu.} = 9 \text{ bu. 2 pk. 2}\frac{2}{5} \text{ qt., Ans.}$$

Ex. 21. $\frac{5}{8}$ bar. : $\frac{7}{8}$ bar. :: \$ $\frac{9}{7}$: ()

$$() = \$\frac{9}{7} \times \frac{7}{8} \times \frac{8}{5} = \$\frac{9}{5}, \text{ Ans.}$$

Ex. 22. $4 \text{ rd.} : 11\frac{3}{4} \text{ rd.} :: \frac{3}{4} \text{ A.} : ()$
 $() = \frac{3}{4} \text{ A.} \times \frac{5.2}{5} \times \frac{1}{4} = 2\frac{7}{10} \text{ A.} = 2 \text{ A. } 28 \text{ rd., } \textit{Ans.}$

Ex. 23. $13 \text{ cwt.} : 12 \text{ cwt.} :: \$42\frac{1}{4} : ()$
 $() = \$14.2 \times \frac{1.2}{1} \times \frac{1}{1.3} = \$39, \textit{Ans.}$

Ex. 24. $16 \text{ oz.} : 12 \text{ oz.} :: \$28 : ()$
 $() = \frac{\$28 \times 12}{16} = \$21, \textit{Ans.}$

Ex. 25. $16 \text{ oz.} - 14\frac{1}{8} \text{ oz.} = 1\frac{5}{8} \text{ oz., cheat in } 16 \text{ oz.}$
 $16 \text{ oz.} : 1\frac{5}{8} \text{ oz.} :: \$30 : ()$
 $() = \$3.9 \times \frac{2.1}{1} \times \frac{1}{1.6} = \$3\frac{1}{2}\frac{5}{8} = \$2.46 +, \textit{Ans.}$

Ex. 26. $1 \text{ yr. } 6 \text{ mo.} : 3 \text{ yr. } 9 \text{ mo.} :: \$750 : ()$
 $() = \frac{\$750 \times 45}{18} = \$1875, \textit{Ans.}$

Ex. 27. $10 \text{ mo.} \times \frac{1.95}{3.5} = 30 \text{ mo., } \textit{Ans.}$

Ex. 28. $\$25 : \$30\frac{1}{2} :: \$28 : ()$
 $() = \$2.2 \times \frac{6.1}{2} \times \frac{1}{2.5} = \$34.16, \textit{Ans.}$

Ex. 29. $1 \text{ yr. } 4 \text{ mo.} = 1\frac{1}{3} = \frac{4}{3} \text{ yr.};$
 $\frac{4}{3} \text{ yr.} \times \frac{2.2}{2.4} = 2\frac{1}{3} \text{ yr.} = 2 \text{ yr. } 9 \text{ mo. } 10 \text{ da. } \textit{Ans.}$

COMPOUND PROPORTION.

(401, page 292.)

Ex. 1. $\left. \begin{matrix} 16 \\ 50 \end{matrix} \right\} : \left. \begin{matrix} 5 \\ 90 \end{matrix} \right\} :: 128 : ()$

16	128
50	5
()	90
()	= 72 \text{ bu., } \textit{Ans.}

Ex. 2. $\left. \begin{matrix} 3 \\ 12 \end{matrix} \right\} : \left(\begin{matrix} \\ 10 \end{matrix} \right) \left\} :: 120 : 360$

120		360
10		3
()		12
5		54
<hr/>		
()	= 104 $\frac{1}{2}$ days, Ans	

Ex. 3. $\left. \begin{matrix} 6 \\ 10 \end{matrix} \right\} : \left. \begin{matrix} 20 \\ 15 \end{matrix} \right\} :: 34 : ()$

6		34
10		20
()		15
<hr/>		
()	= 170 yards, Ans.	

Ex. 4. $\left. \begin{matrix} 450 \\ 12 \\ 12 \end{matrix} \right\} : \left. \begin{matrix} () \\ 9 \\ 8 \end{matrix} \right\} :: 1 : 1$

8		12
9		12
()		450
<hr/>		
()	= 900, Ans	

Ex. 5. $\left. \begin{matrix} 1200 \\ \frac{1}{4} \end{matrix} \right\} : \left(\begin{matrix} \\ \frac{7}{8} \end{matrix} \right) \left\} :: 500 : 960$

500		960
7		8
4		5
()		1200
7		23040
<hr/>		
()	= 3291 $\frac{1}{2}$, Ans	

Ex. 6. $\left. \begin{matrix} 8 \\ 9 \\ 9 \end{matrix} \right\} : \left. \begin{matrix} () \\ 12 \\ 12 \end{matrix} \right\} :: 36 : 48$

36		48
12		9
12		9
()		8
<hr/>		
()	= 6 men, Ans.	

Ex. 7. $\left. \begin{matrix} 4 \\ 2\frac{1}{2} \\ 8\frac{1}{2} \end{matrix} \right\} : \left. \begin{matrix} 15 \\ 3\frac{3}{4} \\ 9 \end{matrix} \right\} : 6\frac{2}{3} : ()$

$\frac{1^2}{1} \times \frac{1^2}{4} \times \frac{1}{2} \times \frac{2^2}{3} \times \frac{1}{4} \times \frac{2}{3} \times \frac{4}{3} = \frac{4^2}{1^2} = 40\frac{1}{2}$, Ans.

$$\text{Ex. 8. } \left. \begin{array}{l} 4\frac{1}{2} \\ 6 \\ 20 \end{array} \right\} : \left. \begin{array}{l} 4\frac{2}{3} \\ 9 \\ () \end{array} \right\} :: 540 : 600$$

$$\frac{600}{1} \times \frac{1}{2} \times \frac{1}{3} \times \frac{2}{1} \times \frac{3}{4} \times \frac{1}{5} \times \frac{1}{240} = \frac{10}{1} = 10, \text{ Ans.}$$

$$\text{Ex. 9. } \left. \begin{array}{l} 2\frac{1}{2} \\ 1\frac{1}{2} \end{array} \right\} : \left. \begin{array}{l} 36\frac{1}{2} \\ 1\frac{1}{2} \end{array} \right\} :: \$3.27\frac{1}{2} : ()$$

$$\frac{\$6.75}{2} \times \frac{73}{2} \times \frac{3}{2} \times \frac{2}{5} \times \frac{5}{7} = \frac{\$1478.25}{28} = \$52.79 +, \text{ Ans}$$

$$\text{Ex. 10. } \left. \begin{array}{l} 5 \\ 6 \end{array} \right\} : \left. \begin{array}{l} () \\ 12 \end{array} \right\} :: 52.2 : 417.6$$

$$\frac{417.6 \times 5 \times 6}{52.2 \times 12} = 20 \text{ men, Ans.}$$

$$\text{Ex. 11. } \left. \begin{array}{l} 6 \\ 2.5 \\ 12.3 \end{array} \right\} : \left. \begin{array}{l} 9 \\ () \\ 8.2 \end{array} \right\} :: \left. \begin{array}{l} 22.5 \\ 17.3 \\ 10.25 \end{array} \right\} : \left. \begin{array}{l} 45 \\ 34.6 \\ 12.3 \end{array} \right\}$$

$$\frac{6 \times 2.5 \times 12.3 \times 45 \times 34.6 \times 12.3}{9 \times 8.2 \times 22.5 \times 17.3 \times 10.25} = 12 \text{ days, Ans.}$$

$$\text{Ex. 12. } \left. \begin{array}{l} 54 \\ 24\frac{1}{2} \\ 12\frac{1}{2} \end{array} \right\} : \left. \begin{array}{l} 75 \\ () \\ 10\frac{1}{2} \end{array} \right\} :: 1 : 1$$

$$\frac{1}{1} \times \frac{1}{2} \times \frac{2}{3} \times \frac{3}{4} \times \frac{4}{5} \times \frac{5}{6} = 1, \text{ Ans.}$$

$$\text{Ex. 13. } \left. \begin{array}{l} 24 \\ 189 \\ 14 \end{array} \right\} : \left. \begin{array}{l} 217 \\ 5\frac{1}{2} \\ () \end{array} \right\} :: \left. \begin{array}{l} 33\frac{1}{4} \\ 5\frac{3}{4} \\ 3\frac{1}{2} \end{array} \right\} : \left. \begin{array}{l} 23\frac{1}{4} \\ 3\frac{3}{4} \\ 2\frac{1}{2} \end{array} \right\}$$

$$\frac{1}{1} \times \frac{1}{2} \times \frac{1}{3} \times \frac{1}{4} \times \frac{1}{5} \times \frac{1}{6} \times \frac{1}{7} \times \frac{1}{8} \times \frac{1}{9} \times \frac{1}{10} \times \frac{1}{11} \times \frac{1}{12} \times \frac{1}{13} \times \frac{1}{14} \times \frac{1}{15} \times \frac{1}{16} = \frac{1}{16}, \text{ Ans.}$$

PARTNERSHIP.

(407, page 295.)

Ex. 2. \$ 8000 $\frac{10000}{40000} = \frac{1}{4}$, A's fraction.
 12000 $\frac{12000}{40000} = \frac{3}{10}$, B's "
 20000 $\frac{20000}{40000} = \frac{1}{2}$, C's "

 \$40000
 $\$1680 \times \frac{1}{4} = \336 , A's ; $\$1680 \times \frac{3}{10} = \504 , B's ;
 $\$1680 \times \frac{1}{2} = \840 , C's.

Ex. 3. $\$1200 + \$1000 + \$600 = \2800 ;
 $\$2800 : \$1200 :: \$224 : () = \96 , A's share ;
 $\$2800 : \$1000 :: \$224 : () = \80 , B's "
 $\$2800 : \$600 :: \$224 : () = \48 , C's "

Ex. 4. $\$20000 : \$13654 :: \$3060 : () = \2089.062
 $\$20000 : \$13654 :: \$1530 : () = \1044.531

Ex. 5. $16 + 24 + 28 + 36 = 104$
 $\$13 \times \frac{16}{104} = \2 , A pays ; $\$13 \times \frac{24}{104} = \3 , B pays ;
 $\$13 \times \frac{28}{104} = \3.50 , C pays ; $\$13 \times \frac{36}{104} = \4.50 , D pays.

Ex. 6. $14 + 6 + 12 = 32$ shares.
 $\$2240 \times \frac{14}{32} = \980 , Captain's share ;
 $\$2240 \times \frac{6}{32} = \420 , Mate's share ;
 $\$2240 \times \frac{12}{32} = \840 , divided among the sailors,
 $\$840 \div 12 = \70 , each sailor's share.

Ex. 7. $\$3475.60 - \$2512 = \$963.60$, lost to the owners ;
 $\$963.60 \times \frac{1}{3} = \120.45 , A's }
 $\$963.60 \times \frac{1}{4} = \240.90 , B's } Ans.
 $\$963.60 \times \frac{2}{3} = \602.25 , C's }

 Proof 1 = \$963.60

Ex. 8. 6, C's proportional share.
 4, D's " "
 $6 + 4 = 10$; $10 \times \frac{1}{2} = 5$, E's " "

$$6 + 4 + 2 = 12$$

$$\left. \begin{aligned} \$2571.24 \times \frac{6}{12} &= \$1285.62, \text{C's;} \\ \$2571.24 \times \frac{4}{12} &= \$857.08, \text{D's;} \\ \$2571.24 \times \frac{2}{12} &= \$428.54, \text{E's;} \end{aligned} \right\} \text{Ans.}$$

Ex. 9. $\$7500 - (\$2000 + \$2800.75 + \$1685.25) = \$1014$,
 D's gain;

gain.	cap.	gain.	cap.	
\$1014	: \$3042	:: \$2000	: ()	= \$6000 A;
\$1014	: \$3042	:: \$2800.75	, ()	= \$8402.25, B;
\$1014	: \$3042	:: \$1685.25	: ()	= \$5055.75, C;

} Ans.

(408, page 297.)

Ex. 2. $\$250 \times 6 = \1500 , B's product;

$$275 \times 8 = 2200, \text{C's "}$$

$$450 \times 4 = 1800, \text{D's "}$$

$$\underline{\$5500}$$

$$\$825 \times \frac{1}{3} = \$225, \text{B's share of gain;}$$

$$825 \times \frac{2}{3} = 330, \text{C's " " "}$$

$$825 \times \frac{1}{3} = 270, \text{D's " " "}$$

Ex. 3. $\$1000 \times 8 = \8000

$$\$1500 \times 4 = \$6000$$

$$1600 \times 10 = 16000$$

$$1200 \times 14 = 16800$$

$$\text{A's product, } \$24000$$

$$\text{B's product, } \$22800$$

$$\$24000 + \$22800 = \$46800, \text{sum of products.}$$

$$\$46800 : \$24000 :: \$1394.64 : () = \$715.20, \text{A's gain.}$$

$$\$46800 : \$22800 :: \$1394.64 : () = \$679.44, \text{B's "}$$

Ex. 4. $4 \times 5 \text{ days} = 20 \text{ days' work A furnished ;}$

$3 \times 6 \text{ " } = 18 \text{ " " B "}$

$6 \times 4 \text{ " } = 24 \text{ " " C "}$

62 " " all "

$372 \text{ bushels} \div 4 = 93 \text{ bushels to be divided.}$

$62 : 20 :: 93 : () = 30 \text{ bu., A's ;}$

$62 : 18 :: 93 : () = 27 \text{ " B's ;}$ } *Ans.*

$62 : 24 :: 93 : () = 36 \text{ " C's ;}$

Ex. 5.

From Jan. 1, 1856, to Apr. 1, 1858, is 27 mo., Gallup's time ;

" Mar. 1, 1856, " Apr. 1, 1858, " 25 " Decker's "

" July 1, 1856, " Apr. 1, 1858, " 21 " Newman's "

$\$3000 \times 27 = \81000 , Gallup's product ;

$2000 \times 25 = 50000$, Decker's "

$1800 \times 21 = 37800$, Newman's "

\$168800, sum of products.

$\$168800 : \$81000 :: \$4388.80 : () = \2106 , Gallup's gain ;

$\$168800 : \$50000 :: \$4388.80 : () = \1300 , Decker's "

$\$168800 : \$37800 :: \$4388.80 : () = \992.80 , Newman's "

Ex. 6. $\$560 \div 8 = \70 , A's monthly profit ;

$\$800 \div 10 = \80 , B's " "

\$150

Since the gains of the partners are proportional to their amounts of capital when the times are equal, we have

$\$150 : \$70 :: \$5600 : () = \$2613.33\frac{1}{3}$, A's gain ;

$\$150 : \$80 :: \$5600 : () = \$2986.66\frac{2}{3}$, B's gain.

Ex. 7. If we allow 2 parts of the gain to A, 3 parts to B, and 4 parts to C, $\frac{1}{2}$ of A's gain will be equal to $\frac{1}{3}$ of B's, and to $\frac{1}{4}$ of C's, and the proportion of the shares will correspond to the conditions.

$$2 + 3 + 4 = 9$$

$$\$117 \times \frac{2}{9} = \$26, \text{ A's gain}$$

$$\$117 \times \frac{3}{9} = \$39, \text{ B's "}$$

$$\$117 \times \frac{4}{9} = \$52, \text{ C's "}$$

If we now divide the proportional shares of the gain, 2, 3, 4, by the respective times, 3, 5, 7, we shall obtain the proportional monthly shares of the gain, which must be in the same proportion as the respective shares of the capital ;

$$2 \div 3 = \frac{2}{3}, \text{ A's proportional share of capital ;}$$

$$3 \div 5 = \frac{3}{5}, \text{ B's " " " "}$$

$$4 \div 7 = \frac{4}{7}, \text{ C's " " " "}$$

$$\frac{2}{3} + \frac{3}{5} + \frac{4}{7} = \frac{182}{105}, \text{ sum of proportional shares.}$$

$$\frac{182}{105} : \frac{2}{3} :: \$1930 : () = \$700, \text{ A's capital ;}$$

$$\frac{182}{105} : \frac{3}{5} :: \$1930 : () = \$630, \text{ B's "}$$

$$\frac{182}{105} : \frac{4}{7} :: \$1930 : () = \$600, \text{ C's "}$$

ANALYSIS.

(412, page 300.)

Ex. 5. We multiply the number of casks by the number of pounds per cask, and this product by the number of pence per pound, and obtain the cost in pence; which, divided by 56, the number of pence in a dollar, gives \$27, answer.

$$\begin{array}{r|l} & 3 \\ 56 & 126 \\ \hline & 4 \\ & \$27, \text{ Ans} \end{array}$$

Ex. 6. We multiply 19 (pence) by 28 for the cost of the butter (in pence), and divide by 7 times 12 (pence) the price of the tea.

$$\begin{array}{r|l} 7 & 28 \\ 12 & 19 \\ \hline 3 & 19 \\ \hline & 6\frac{1}{3}, \text{ Ans} \end{array}$$

Ex 7. 10 s. 6 d.=126 d. The product of 2, 72, and 4 is the number of quarts. Multiply this by 126, the selling price per quart, and divide by 96, to reduce the result to Decimal currency, and we obtain \$756. Subtracting the cost we obtain the profit.

$$\begin{array}{r|l} & 2 \\ & 72 \\ & 4 \\ 96 & 126 \\ \hline & \$756 \end{array}$$

$$\$756 - \$648 = \$108, \text{ Ans.}$$

Ex. 8. 2 s. 6 d.=30 d. Then $2 \times 3 \times 7 \times 30 = \text{cost in pence}$. Divide by 60 to reduce to Decimal currency.

$$\begin{array}{r|l} & 2 \\ & 3 \\ & 7 \\ 60 & 30 \\ \hline & \$21, \text{ Ans.} \end{array}$$

Ex. 9. $20 \times 3 \times 12 = \text{value of the apples in pence}$. Divide by 6 s. 3 d. (=75 d.) to find the number of days' work to be given in exchange.

$$\begin{array}{r|l} & 20 \\ & 3 \\ 75 & 12 \\ \hline 5 & 48 \\ \hline & 9\frac{2}{3}, \text{ Ans.} \end{array}$$

Ex. 10.

$$\begin{array}{r|l} & 160 \\ 96 & 18 \\ \hline \text{Cost, } \$30 & \end{array}$$

$$\begin{array}{r|l} & 160 \\ 90 & 24 \\ \hline \text{sold for } \$42.66\frac{2}{3} & \end{array}$$

$$\$42.66\frac{2}{3} - \$30 = \$12.66\frac{2}{3}, \text{ Ans.}$$

Ex. 11. $43\frac{1}{2} = \frac{87}{2}$; 10 s. 6 d.=126 d.;
8 s. 3 d.=99 d.

$$\begin{array}{r|l} & 87 \\ 99 & 126 \\ \hline 11 & 609 \\ \hline & 55\frac{4}{11} \text{ Ans.} \end{array}$$

Ex. 12. 9 s. 4 d.=112 d.;
\$1=96 d., Mich. currency

$$\begin{array}{r|l} & 300 \\ 96 & 112 \\ \hline & \$350, \text{ Ans.} \end{array}$$

Ex. 16. Dividing 128 by 16, we obtain what 1 horse will consume in 50 days; dividing this result by 50, we obtain what 1 horse will consume in 1 day. Multiplying by 5, we find what 5 horses will consume in 1 day; and multiplying this result by 90, we find what 5 horses will consume in 90 days.

$$\begin{array}{r|l} 16 & 128 \\ 50 & 5 \\ \hline & 90 \\ & 72, \text{ Ans.} \end{array}$$

Ex. 17. Divide $4\frac{2}{3}$ ($=\frac{14}{3}$) by $10\frac{1}{2}$ ($=\frac{21}{2}$) to find what amount of wood \$1 will buy; then multiply by $24\frac{3}{4}$ ($=\frac{99}{4}$) to find how much \$24 $\frac{3}{4}$ will buy.

$$\begin{array}{r|l} 3 & 14 \\ 21 & 2 \\ 4 & 99 \\ \hline & 11, \text{ Ans.} \end{array}$$

Ex. 18. $52 \times 3 \times 1\frac{2}{3} =$ the money given for the cloth. Divide this result by 65, the number of yards, to find the price per yard.

$$\begin{array}{r|l} & 52 \\ & 3 \\ 3 & 100 \\ 65 & \\ \hline & \text{Ans. 80 cents.} \end{array}$$

Ex. 19. A shadow of 1 foot will require an object $\frac{1}{3}$ of 3 feet in length; and a shadow of $46\frac{2}{3}$ feet will require an object $46\frac{2}{3}$ times $\frac{1}{3}$ of 3 feet in length; hence

$$\frac{2}{3} \times \frac{1}{3} \times 1\frac{2}{3} = 28 \text{ feet, Ans.}$$

Ex. 20.

8 sheep $\times 7\frac{1}{2} =$ 60 sheep for 1 mo., A's use of the pasture;
 12 " $\times 4\frac{1}{2} =$ 50 " " " , B's " " "
 15 " $\times 6\frac{2}{3} =$ 100 " " " , C's " " "
 210 " " " , total " " "

Each man should pay such part of the whole cost as his use of the pasture is part of the total use; hence

$$\begin{aligned} \$63 \times \frac{60}{210} &= \$18, \text{ A must pay;} \\ \$63 \times \frac{50}{210} &= \$15, \text{ B " " } \\ \$63 \times \frac{100}{210} &= \$30, \text{ C " " } \end{aligned}$$

Ex. 21. 1 bu. oats = $\frac{2}{3}$ dollars ;

1 bu. rye = $\frac{1}{2}$ bu. oats = $\frac{1}{2} \times \frac{2}{3}$ dollars ;

1 bu. wheat = $\frac{1}{4}$ bu. rye = $\frac{1}{4} \times \frac{1}{2} \times \frac{2}{3}$ dollars.

If we divide \$30 by the price of 1 bushel of wheat, we shall have the number of bushels which \$30 will buy ; hence

$$\frac{3}{1} \times \frac{3}{2} \times \frac{1}{4} \times \frac{1}{2} = 15 \text{ bu. } \text{Ans.}$$

Ex. 22. If \$480 gain \$84 in any time,
to gain \$21 in the same time will require
 $\frac{2}{3}$ of \$480 ; and if $\frac{2}{3}$ of \$480 gain \$21
in 30 mo., to gain the same amount in 15
mo. will require $\frac{1}{2}$ of $\frac{2}{3}$ of \$480.

$$\begin{array}{r|l} 84 & 480 \\ 15 & 21 \\ \hline & 30 \\ & \$240, \text{ Ans.} \end{array}$$

Ex. 23. $28 \times \frac{3}{4} = 21$ sq. yd., contents of the 28 yd. ;

$21 \div \frac{2}{3} = 31\frac{1}{2}$ yd. of that which is $\frac{2}{3}$ yd. wide.

Ex. 24. If 130 miles require 3 days, 390
miles will require $\frac{3}{2}$ of 3 days ; and if 14
hours a day require 3 days, 7 hours a day will
require $\frac{1}{2}$ of 3 days.

$$\begin{array}{r|l} 130 & 3 \\ 7 & 390 \\ \hline & 14 \\ & 18, \\ & \text{Ans.} \end{array}$$

Ex. 25. If 6 men cut 45 cords in any time, 8
men can cut $\frac{4}{3}$ of 45 cords in the same time ;
and if in 3 days any number of cords be cut, in
9 days there will be cut $\frac{3}{2}$ times as many cords.

$$\begin{array}{r|l} 6 & 45 \\ 3 & 8 \\ \hline & 9 \\ & 180, \\ & \text{Ans.} \end{array}$$

Ex. 26.

A's age + B's age = $1 + 1\frac{1}{2}$ = $2\frac{1}{2}$ times A's ;

C's age = $2\frac{1}{3}$ times this sum = $5\frac{1}{3}$ " "

And the sum of all their ages, or 93 yr. = $7\frac{2}{3}$ " "

Hence, $93 \div 7\frac{2}{3} = 12$ yr., A's age ;

$12 \times 1\frac{1}{2} = 18$ " B's " } *Ans.*
 $12 \times 5\frac{1}{3} = 63$ " C's "

Ex. 27.

1 day of C $= \frac{1}{10}$ da. of D ;
 1 day of B $= \frac{1}{2}$ da. of C $= \frac{1}{2} \times \frac{1}{10}$ da. of D ;
 1 day of A $= \frac{2}{3}$ da. of B $= \frac{2}{3} \times \frac{1}{2} \times \frac{1}{10}$ da. of D ;
 hence 5 days of A $= \frac{2}{3} \times \frac{1}{2} \times \frac{1}{10} \times 5$ da. of D $= 8$ da.
 of D, *Ans.*

Ex. 33. If the cost of 12 oranges and 10 lemons is 54 cents, the cost of one half the lot, or 6 oranges and 5 lemons, will be 27 cents.

O.	L.	cts.
6	7	33
12	10	54
6	5	27
	2	6

But the cost of 6 oranges and 7 lemons is 33 cents. And, by subtracting, we find the cost of 2 lemons to be 6 cents, which gives the cost of 1 lemon 3 cents. From the first expression, 6 oranges and 21 cents (equal to 7 lemons) is equal to 33 cents; hence 6 oranges are worth 12 cents, and 1 orange is worth 2 cents.

Ex. 34. $18 \times 20 \times 1000 =$ the whole number of ounces of provisions; and since this quantity is to supply 1600 men 30 days, we divide by 30 to find the daily allowance for the army, and this result by 1600 to find the daily allowance to each man.

	18
30	20
1600	1000
2	15
<i>Ans.</i> $7\frac{1}{2}$, oz.	

Ex. 35. If we add 6 bushels to the smaller bin, there will be 60 bushels in both; but as the larger will then contain 2 times as many bushels as the smaller, the two together will contain three times the number in the smaller; hence

3 times the smaller $= 60$

The smaller $= 20$

The larger $= 20 \times 2 = 40$, *Ans.*

Ex. 36. We take the difference of two numbers from the greater to find the less. The greater diminished by $\frac{1}{3}$ of the greater equals the less, which must be $\frac{2}{3}$ of the greater. And if the less be $\frac{2}{3}$ of the greater, their sum, 20, is $1\frac{2}{3}$ times the greater. Hence we have

$$20 \div 1\frac{2}{3} = 12, \text{ the greater, } \textit{Ans.}$$

Ex. 37. 1 day of C = $\frac{1}{4}$ da. of B;
 1 day of A = $\frac{3}{4}$ da. of C = $\frac{3}{4} \times \frac{1}{4}$ da. of B; hence
 6 days of A = $6 \times \frac{3}{4} \times \frac{1}{4}$ da. of B; and,
 6 weeks of A = $6 \times \frac{3}{4} \times \frac{1}{4}$ wk. of B.
 $6 \times \frac{3}{4} \times \frac{1}{4}$ wk. = $11\frac{1}{4}$ wk., *Ans.*

Ex. 38. $36 \times 1\frac{1}{4} = 45$ sq. yd. to be lined.
 $45 \text{ yd.} \div \frac{3}{4} = 60$ yds., *Ans.*

Ex. 39. $80 \times 3\frac{1}{4} \times 96 =$ value of the
 broadcloth, in pence; $104 \times 10 =$ value of
 one sack of coffee, in pence; and to obtain
 the number of sacks we divide the former
 product by the latter.

4	80
104	13
10	96
24,	<i>Ans.</i>

Ex. 40. If the time past since noon is equal to $\frac{1}{4}$ of the time to midnight, *both* intervals, or 12 hours, must be $1\frac{1}{4}$ times the time to midnight; hence

$$12 \text{ h.} \div 1\frac{1}{4} = 10 \text{ h. to midnight.}$$

$$12 \text{ h.} - 10 \text{ h.} = 2 \text{ h. P. M., } \textit{Ans.}$$

Ex. 41 She bought one half for $\frac{1}{4}$ cent apiece;
 And the other half for $\frac{1}{5}$ cent apiece.
 $(\frac{1}{4} + \frac{1}{5}) \div 2 = \frac{9}{40}$, average buying price;
 $3 \div 5 = \frac{3}{5}$, selling price.
 $\frac{3}{5} - \frac{9}{40} = \frac{3}{40}$, gain on one peach.
 $55 \div \frac{3}{40} = 300$, *Ans.*

Ex. 42. A can build the boat in $18 \times 10 = 180$ hours ;

B " " " " " $9 \times 8 = 72$ "

A " " $\frac{1}{180}$ of the boat in an hour ;

B " " $\frac{1}{72}$ " " " "

A and B can build $\frac{1}{180} + \frac{1}{72} = \frac{7}{360}$ of the boat in an hour ;

A and B can build $\frac{7}{360} \times 6 = \frac{7}{60}$ of the boat in a day of 6 hours.

It will, therefore, require as many days as 7 is contained times in 60 ; hence

$$60 \div 7 = 8\frac{4}{7} \text{ days, } \textit{Ans.}$$

Ex. 43. He spent at first $\frac{1}{2}$, and he had $\frac{1}{2}$ left. He then spent $\frac{1}{3}$ of this $\frac{1}{2}$, and he had $\frac{2}{3}$ of this $\frac{1}{2}$ left ; hence $\frac{2}{3}$ of $\frac{1}{2} = \frac{1}{3}$ of his money, which is \$10, and the whole is \$30, *Ans.*

Ex. 44. 4 times the work will require 4 times as many men, and $\frac{1}{2}$ of the time will require 5 times as many men ; hence

$$30 \times 4 \times 5 = 600, \textit{Ans.}$$

Ex. 45. If \$3.25 buy 16.25 lb., \$1.25 will buy $\frac{1}{3}\frac{2}{5}$ of 16.25 lb. ; hence

$$16.25 \text{ lb.} \times \frac{1}{3}\frac{2}{5} = 6.25 = 6\frac{1}{4} \text{ lb., } \textit{Ans.}$$

Ex. 46. On every idle day he lost the forfeit, \$1, and his wages, \$2.50, which together amount to \$3.50. Had he labored every day, he would have received $\$2.50 \times 20 = \50 .

$\$50 - \$43 = \$7$, what he lost by being idle ;

and $\$7 \div \$3.50 = 2$, the number of idle days. Hence

$20 - 2 = 18$, the number of days he labored, *Ans.*

Ex. 47. A, B, and C perform $\frac{1}{12}$ in an hour

A and B " $\frac{1}{16}$ " "

Hence, C performs $\frac{1}{12} - \frac{1}{16} = \frac{1}{48}$ " "

Again, A, B, and C perform $\frac{1}{12}$ " "

A and C " $\frac{1}{18}$ " "

Hence, B performs $\frac{1}{12} - \frac{1}{18} = \frac{1}{36}$ " "

Therefore, B and C perform $\frac{1}{36} + \frac{1}{48} = \frac{1}{144}$ " "

And in $9\frac{1}{2}$ hours they will perform $\frac{1}{144} \times 9\frac{1}{2} = \frac{1}{3}$, *Ans.*

ALLIGATION.

(414, page 305.)

Ex. 2. $\$1.00 \times 12 = \12.00

$1.50 \times 5 = 7.50$

3

$20 \overline{) \$19.50}$

$\$.975, Ans.$

Ex. 3. $\$1.25 \times 52 = \65

13

$65 \quad 65$

Mixture, $\$1$ per gal.

$65 \times 32 \times \$.06\frac{1}{4} = \130 , receipts ; $\$130 - \$65 = \$65$, gain.

Ex. 4. $8 \times 10 = 80$

$9 \times 12 = 108$

$11 \times 16 = 176$

$38 \quad 364$

$38 \times 10 = 380$

Ans. 16 cents.

Ex. 5. $12 \times 7\frac{1}{2} = 90$

$10\frac{1}{2} \times 8 = 84$

$11 \times 9 = 99$

$10 \times 10\frac{1}{2} = 105$

$35 \quad 378$

$378 \times 1\frac{1}{2} = 567$

Ans. $567 \div 35 = 16\frac{1}{2}$ cts.

Ex. 6.

$50 \times 4 = 200$ lbs. ; $\$.13 \times 200 = \26.00

$40 \times 10 = 400$ lbs. ; $.10 \times 400 = 40.00$

$25 \times 24 = 600$ lbs. ; $.07 \times 600 \quad 42.00$

$1200 \overline{) \$108.00}$

$\$.09$ average cost per lb

$\$.095 - \$.09 = \$.005$; $1200 \times \$.005 = \6 , *Ans.*

(416, page 310.)

$$\text{Ex. 3. } 12 \left\{ \begin{array}{c|c|c|c|c|c|c|c} 10 & \frac{1}{2} & & & 1 & & 1 & \\ \hline 11 & & 1 & & & 2 & 2 & \\ \hline 14 & \frac{1}{2} & \frac{1}{2} & & 1 & 1 & 2 & \end{array} \right.$$

Ans. 1 lb. at 10, and 2 lbs. at 11 and 14 cents.

$$\text{Ex. 4. } 90 \left\{ \begin{array}{c|c|c|c} 0 & \frac{1}{36} & 1 & \\ \hline 120 & \frac{1}{36} & 3 & \end{array} \right.$$

Ans. 1 gal. of water to 3 gal. of wine.

$$\text{Ex. 5. } 275 \left\{ \begin{array}{c|c|c|c|c|c|c|c} 200 & \frac{1}{12} & & 3 & & 3 & & \\ \hline 250 & & \frac{1}{12} & & 1 & 1 & & \\ \hline 300 & & \frac{1}{12} & & 1 & 1 & & \\ \hline 400 & \frac{1}{12} & & 5 & & 5 & & \end{array} \right.$$

Ans. 5 of the 1st kind, 1 of each of the 2d and 3d, and 3 of the 4th.

$$\text{Ex. 6. } 90 \left\{ \begin{array}{c|c|c|c|c|c|c|c|c} 80 & \frac{1}{6} & & & 6 & & & 6 & \\ \hline 84 & & \frac{1}{6} & & & 6 & & 6 & \\ \hline 87 & & & \frac{1}{6} & & & 4 & 4 & \\ \hline 94 & & & \frac{1}{6} & & & 3 & 3 & \\ \hline 96 & \frac{1}{6} & \frac{1}{6} & & 10 & 6 & & 16 & \end{array} \right.$$

Ans. 6 of the first 2 kinds, 4 of the third, 3 of the fourth, and 16 of the fifth.

(417, page 311.)

$$\text{Ex. 2. } 80 \left\{ \begin{array}{c|c|c|c|c|c|c|c|c|c} 40 & \frac{1}{8} & & & 2 & & & 2 & 20 & \\ \hline 60 & & \frac{1}{8} & & & 2 & & 2 & 20 & \\ \hline 75 & & & \frac{1}{8} & & & 2 & 2 & 20 & \\ \hline 90 & \frac{1}{8} & \frac{1}{8} & \frac{1}{8} & 8 & 4 & 1 & 13 & 130 & \end{array} \right.$$

Ans. 20 lbs. of each of the first three kinds, and 130 lbs. of the fourth.

$$\text{Ex. 3. } 4 \left\{ \begin{array}{c|c|c|c|c|c|c|c} 2 & \frac{1}{2} & & & 1 & & 1 & 24 \\ \hline 3 & & 1 & & 1 & 1 & 1 & 24 \\ \hline 5 & 1 & 1 & & 2 & 1 & 3 & 72 \end{array} \right.$$

Ans. 24 at \$3, and 72 at \$5.

$$\text{Ex. 4. } 90 \left\{ \begin{array}{c|c|c|c|c|c|c|c} 0 & \frac{1}{5} & & 4 & & 4 & 60 \\ 60 & & \frac{1}{3} & & 4 & & 60 \\ 130 & \frac{1}{4} & \frac{1}{4} & 9 & 3 & 12 & 180 \end{array} \right.$$

Ans. 60 gallons each of alcohol and water.

$$\text{Ex. 5. } 40 \left\{ \begin{array}{c|c|c|c} 35 & \frac{1}{2} & 2 & 150 \\ 50 & \frac{1}{10} & 1 & 75 \end{array} \right. \quad \text{Ans. 150.}$$

$$\text{Ex. 6. } 7\frac{1}{2} \left\{ \begin{array}{c|c|c|c|c|c|c|c} 6\frac{1}{2} & \frac{4}{5} & \frac{4}{5} & 4 & 4 & 8 & 80 \\ 8\frac{1}{3} & \frac{4}{3} & \frac{4}{3} & 6 & & 6 & 60 \\ 10 & & \frac{4}{3} & & 2 & 2 & 20 \end{array} \right.$$

Ans. 60 lbs. at $8\frac{1}{3}$ cts. and 20 lbs. at 10 cts.

(418, page 312.)

$$\text{Ex. 2. } 14 \left\{ \begin{array}{c|c|c|c|c|c|c|c} 9 & \frac{1}{2} & & 6 & & 6 & 60 \\ 12 & & \frac{1}{2} & & 4 & & 40 \\ 18 & & \frac{1}{4} & & 2 & & 20 \\ 20 & \frac{1}{8} & & 5 & & 5 & 50 \\ \hline & & & & & 17 & 170 \end{array} \right.$$

Ans. 60 at 9 s., 40 at 12 s.; 20 at 18 s., and 50 at 20 s.

$$\text{Ex. 3. } 22 \left\{ \begin{array}{c|c|c|c|c|c|c|c} 16 & \frac{1}{6} & & & 2 & & 2 & 6 \\ 18 & & \frac{1}{4} & & & 2 & & 6 \\ 21 & & & 1 & & & 2 & 6 \\ 24 & \frac{1}{3} & \frac{1}{3} & \frac{1}{3} & 6 & 4 & 1 & 11 & 33 \\ \hline & & & & & & & 17 & 51 \end{array} \right.$$

Ans. 6 ounces each of the first three, and 33 ounces of the last.

Ex. 4. $\$178.50 \div 210 = \$.85$, average price ;

$$85 \left\{ \begin{array}{c|c|c|c|c|c|c|c} 50 & \frac{1}{5} & & 13 & & 13 & & 78 \\ 75 & & \frac{1}{10} & & 13 & & & 78 \\ 150 & \frac{1}{5} & \frac{1}{5} & 7 & 2 & 9 & & 54 \\ \hline & & & & & 35 & & 210 \end{array} \right.$$

Ans. 78 bu each of oats and corn, and 54 bu. of wheat

$$\text{Ex. 5. } 48 \left\{ \begin{array}{c|c|c|c|c|c|c} 45 & \frac{1}{3} & \frac{1}{3} & 1 & 2 & 3 & 3600 \\ 51 & \frac{1}{3} & & 1 & & 1 & 1200 \\ 54 & & & & 1 & 1 & 1200 \\ \hline & & & & & 5 & 6000 \end{array} \right.$$

Ans. A 3600 bu.; B and C each 1200 bu.

Ex. 6. $\$84 \div 56 = \1.50 , average daily wages.

$$150 \left\{ \begin{array}{c|c|c|c|c|c|c} 50 & 1\frac{1}{5} & & 6 & 6 & 24 \\ 75 & & 1\frac{1}{5} & & 1 & 4 \\ 175 & & 2\frac{1}{5} & & 3 & 12 \\ 300 & 1\frac{1}{5} & & 4 & 4 & 16 \\ \hline & & & & 14 & 56 \end{array} \right.$$

Ans. The boys 24, 4, and 12 days, respectively, and the man 16.

EVOLUTION.

SQUARE ROOT.

(434, page 319.)

Ex. 9. *Ans.* 234135.

(441, page 321.)

Ex. 3. $200 \times 1\frac{1}{4} = 225$ sq. yd.; $\sqrt{225} = 15$ yd. = 45 ft., *Ans.*

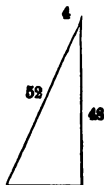
Ex. 4. 10 A. = 1600 rd.; $\sqrt{1600} = 40$ rd., length of one side; $40 \times 4 = 160$ rd., *Ans.*

Ex. 5. $45^2 = 2025$, square of the base;
 $60^2 = 3600$, square of the perpendicular;
5625, square of the hypotenuse.
 $\sqrt{5625} = 75$, *Ans.*

Ex. 6. $39^2 = 1521$, square of the hypotenuse
 $15^2 = 225$, square of the base;
 $\underline{1296}$, square of the perpendicular.
 $\sqrt{1296} = 36$, height of the stump.
 $36 \text{ ft.} + 39 \text{ ft.} = 75 \text{ ft.}$, *Ans.*

Ex. 7. $\sqrt{40^2 - 33^2} = 22.60 +$, from foot of ladder to one side;
 $\sqrt{40^2 - 21^2} = 34.04 +$ " " " " " other "
 $\underline{56.64 +}$, *Ans.*

Ex. 8. $52^2 = 2704$, square of hypotenuse;
 $48^2 = 2304$, square of perpendicular;
 $\underline{400}$, square of the base;
 $\sqrt{400} = 20$, *Ans.*



Ex. 9. 1 mi. = 320 rd., length of 1 side of the park.
 $320^2 = 102400$
 $\underline{102400}$
 204800 ; $\sqrt{204800} = 452.5 +$, diagonal.

$320 \times 2 = 640$, distance around the park to the opposite corner.
 $640 - 452.5 = 187.5$, distance between A and B, when A arrives at the opposite corner. $187.5 \div 2 = 93.75 +$, *Ans.*

Ex. 10. $20^2 + 16^2 =$ square of the diagonal of the floor. The diagonal of the floor and the height of the room will form the base and perpendicular of a right-angled triangle, of which the diagonal from the lower corner to the opposite upper corner is the hypotenuse. Hence

$$\left. \begin{array}{l} 20^2 = 400 \\ 16^2 = 256 \end{array} \right\} \text{square of the diagonal of the floor;}$$

$12^2 = 144$ square of the perpendicular;
 $\underline{800}$ square of the required diagonal;
 $\sqrt{800} = 28.284271 +$ feet, *Ans.*

Ex. 11. $2 : 3 :: (63.39)^3 : () = 6027.43815$
 $\sqrt[4]{6027.43815} = 77.63 + \text{rods, } \textit{Ans.}$

Ex. 12 $1 : 2 :: 5^3 : () = 50 ;$
 $\sqrt[4]{50} = 7.07106 + \text{feet, } \textit{Ans.}$

CUBE ROOT.

(444, page 327.)

APPLICATIONS IN CUBE ROOT.

Ex. 1. $\sqrt[3]{1381} = 11 \text{ ft., } \textit{Ans.}$

Ex. 2. $\sqrt[3]{373248} = 72 \text{ in.} = 6 \text{ ft., } \textit{Ans.}$

Ex. 3. $\sqrt[3]{474552} = 78 \text{ in.} = 6\frac{1}{2} \text{ ft., length of 1 side ;}$
 $6\frac{1}{2} \times 6\frac{1}{2} = 42\frac{1}{4} \text{ sq. ft., } \textit{Ans.}$

Ex. 4. $\sqrt[3]{\frac{2}{3}} = \frac{2}{3} \text{ ft., length of 1 side ;}$
 $\frac{2}{3} \times \frac{2}{3} \text{ sq. ft.} = \text{area of 1 side ;}$
 $\frac{2}{3} \times \frac{2}{3} \times 6 \times \frac{1}{3} = \frac{2}{3} \text{ sq. yd., area of 6 sides, } \textit{Ans.}$

Ex. 5. If the bin be divided by a vertical section equidistant from the ends, the two parts will be cubes, each of a capacity of one half of the bin.

$125 \times 2150.4 = 268800 \text{ cu. in. in the bin ;}$
 $268800 \div 2 = 134400 \text{ cu. in., contents of one half.}$
 $\sqrt[3]{134400} = 51.223 + \text{in., width and depth.}$
 $51.223 \times 2 = 102.446 \text{ in., length.}$

Ex. 7. $1 : 2 = (14.9)^3 : () = 6615.898$
 $\sqrt[3]{6615.898} = 18.7 + \text{inches, } \textit{Ans.}$

Ex. 8. $16 : 25 :: 8 : () = 12.5 \text{ cube of the diameter.}$
 $\sqrt[3]{12.5} = 2.32 + \text{ft.}$

ARITHMETICAL PROGRESSION.

(451, page 329.)

- Ex. 1. $(19-1) \times 3 = 54$; $54 + 4 = 58$, *Ans.*
 Ex. 2. $(13-1) \times 5 = 60$; $75-60 = 15$, *Ans.*
 Ex. 3. 2=first term; 3=com. diff.; 18=No. terms.
 $(18-1) \times 3 = 51$; $51 + 2 = 53$ cents, *Ans.*
 Ex. 4. $(40-1) \times \frac{1}{4} = 9\frac{3}{4}$; $9\frac{3}{4} + \frac{1}{2} = 10\frac{1}{4}$, *Ans.*
 Ex. 5. 20=first term; 5=com. diff.; 9=No. terms.
 $(9-1) \times 5 = 40$; $40 + 20 = 60$, *Ans.*
 Ex. 6. 100=first term; 7=com. diff.; 46=No. terms.
 $(46-1) \times 7 = 315$; $315 + 100 = \$415$, *Ans.*

(452, page 330.)

- Ex. 1. $17-2 = 15$; $15 \div 5 = 3$, *Ans.*
 Ex. 2. $14-2 = 12$; $12 \div 6 = 2$ years, *Ans.*
 Ex. 3. $50\frac{1}{2} - 1 = 49\frac{1}{2}$; $49\frac{1}{2} + 33 = 1\frac{1}{2}$, *Ans.*
 Ex. 4. 3=first term; $9\frac{1}{2}$ =last term; 14=No. terms.
 $9\frac{1}{2} - 3 = 6\frac{1}{2}$; $6\frac{1}{2} \div 13 = \frac{1}{2}$, com. dif.

(453.)

- Ex. 1. $43-7-36$; $36 \div 4 = 9$; $9 + 1 = 10$, *Ans.*
 Ex. 2. $40-2\frac{1}{2} = 37\frac{1}{2}$; $37\frac{1}{2} \div 7\frac{1}{2} = 5$; $5 + 1 = 6$, *Ans.*
 Ex. 3. 6=first term; 226=last term; 4=com. diff.
 $226-6 = 220$; $220 \div 4 = 55$; $55 + 1 = 56$, *Ans.*

(454, page 331.)

- Ex. 1. $(5+32) \times \frac{1}{2} = 222$, *Ans.*
 Ex. 2. $(1+12) \times \frac{1}{2} = 78$, *Ans.*

Ex. 3. $24 = \text{first term}$; $1224 = \text{last term}$; $52 = \text{No. terms}$.
 $(\$1224 + \$24) \times \frac{52}{2} = \32448 , *Ans.*

Ex. 4. $4 = \text{first term}$, or twice the distance to the first apple,
 $400 = \text{last " " " " " " " last "}$
 $100 = \text{No. terms}$.
 $(400 \text{ yd.} + 4 \text{ yd.}) \times \frac{100}{2} = 20200 \text{ yd.}$, *Ans.*

GEOMETRICAL PROGRESSION.

(458, page 333.)

Ex. 1. $4 \times 3^8 = 26244$, *Ans.*

Ex. 2. $1024 \times (\frac{1}{4})^7 = \frac{1024}{16384} = \frac{1}{16}$, *Ans.*

Ex. 3. $1 = \text{first term}$; $2 = \text{ratio}$; $9 = \text{No. terms}$.
 $1 \text{ mill} + 2^9 = 256 \text{ mills} = \$.256$, *Ans.*

Ex. 4. $7 \times (\frac{1}{7})^8 = \frac{7}{7^8} = \frac{1}{7^7} = \frac{1}{16807}$, *Ans.*

Ex. 5. $1 = \text{first term}$; $1.07 = \text{ratio}$; $5 = \text{No. terms}$.
 $1 \times (1.07)^4 = \$1.40255 +$, *Ans.*

Ex. 6. $3 = \text{first term}$; $3 = \text{ratio}$; $7 = \text{No. terms}$.
 $\$3 \times 3^6 = \2187 , *Ans.*

(459, page 334.)

Ex. 1. $(512 \times 3) - 2 = 1534$; $1534 \div 2 = 767$, *Ans.*

Ex. 2. $(262144 \times 4) - 4 = 1048572$;
 $1048572 \div 3 = 349524$, *Ans.*

Ex. 3. $(162 \times 3) - 2 = 484$; $484 \div 2 = 242$, *Ans.*

Ex. 4. $\frac{1}{2} \div \frac{1}{4} = \frac{1}{2}$, ratio;
 $(\frac{1}{2} \times 5) - 0 = 1$; $1 \div 4 = \frac{1}{4}$, *Ans.*

Ex. 5. $2 = \text{first term}$; $6 \div 2 = 3$, ratio; $12 = \text{No. terms}$.

$$\$2 \times 3^{11} = \$354294, \text{ last term};$$

$$(\$354294 \times 3) - 2 = \$1062880;$$

$$\$1062880 \div 2 = \$531440, \text{ Ans.}$$

Ex. 6. $7 = \text{first term, or yield of the first year}$;

$$7 = \text{ratio};$$

$12 = \text{No. terms, or the number of years to yield}$.

$$7 \times 7^{11} = 7^{12} = 13841287201, \text{ last term, or 12th year's produce.}$$

$$\frac{(13841287201 \times 7) - 7}{6} = 16148168400, \text{ sum of all terms.}$$

$$16148168400 \div 1000 = 16148168.4 \text{ pt.}$$

$$16148168.4 \text{ pt.} = 252315 \text{ bu. } 4\frac{1}{2} \text{ qt., Ans.}$$

Ex. 7. $200 \div 20 = 10$, the number of times the family doubled its number.

$$10 + 1 = 11, \text{ No. terms}; 2 \text{ ratio.}$$

$$6 \times 2^{10} = 6144, \text{ Ans.}$$

PROMISCUOUS EXAMPLES.

(Page 334.)

Ex. 1. $800 \times 2 = 1600$, the sum; and

$$200 \times 2 = 400, \text{ the difference.}$$

The greater of any two numbers is equal to the less + the difference; and the greater and the less, or the sum of the numbers, must be composed of twice the less and the difference. Hence

$$1600 - 400 = 1200, \text{ twice the less};$$

$$1200 \div 2 = 600, \text{ the less};$$

$$600 + 400 = 1000, \text{ the greater.}$$

Ex. 2. $\frac{2}{3}$ of $\frac{1}{11} = \frac{2}{11}$. If $\frac{2}{11}$ of a number be added to itself, the result must be $1\frac{2}{11}$ times the number. Hence,

$$61 \div 1\frac{2}{11} = 55, \text{ Ans.}$$

Ex. 3. 3 h. 21 min. 15 sec. = 12075 sec.; 1 da. = 86400 sec.;

$$1\frac{2}{3} \frac{2}{3} \frac{1}{3} \text{ da.} = 1\frac{1}{3} \frac{1}{3} \text{ da., Ans.}$$

Ex. 4. 3 bu. 3 pk. 3 qt.

$$\begin{array}{r} 10 \\ \hline 38 \text{ bu. } 1 \text{ pk. } 6 \text{ qt.} \\ 7 \\ \hline 269 \text{ bu. } 0 \text{ pk. } 2 \text{ qt., Ans.} \end{array}$$

Ex. 5. A and B together have 3 times A's;

C and D together have \$300 + \$500 = \$800;

And they all have 3 times A's + \$800.

Therefore, \$1100 - \$800 = \$300 = 3 times A's.

$$\$300 \div 3 = \$100, \text{ Ans.}$$

Ex. 6. B has A's votes + 200

C has A's votes + 1000

A B and C have 3 times A's votes + 1200

Therefore, 3000 - 1200 = 1800, 3 times A's votes.

$$1800 \div 3 = 600, \text{ Ans.}$$

$$\text{Ex. 7. } \frac{3\frac{1}{2}}{17\frac{1}{2}} = \frac{13}{70}, \text{ Ans.}$$

Ex. 8. $\frac{7}{8} - \frac{1}{8} = \frac{1}{8}$. Hence 10 is $\frac{1}{8}$ of the number; and the number must be 80, Ans.

Ex. 9. \$28.35 ÷ \$.35 = 81 gal. mixture.

$$81 - 63 = 18 \text{ gal. water added.}$$

Ex. 10. When A had gained $\frac{1}{3}$, he had $\frac{2}{3}$ of the original stock. B, after his loss, had $\frac{1}{3}$ as much, or $\frac{2}{9}$ of the original stock; hence he had lost $\frac{1}{9}$; the \$200 which he lost was $\frac{1}{9}$ of his stock; and his whole stock must have been $200 \div \frac{1}{9} = \$1800$.

Ex. 11. $\$.35 \times 13 = \4.55 ; $\$31.55 - \$4.55 = \$27$, cost of the whole, if the wheat had been at the same price as the barley.

$17 + 13 = 30$, whole number of bushels.

$\$27 \div 30 = \$.90$, price of barley, }
 $\$.90 + \$.35 = \$1.25$, price of wheat, } *Ans.*

Ex. 12. 4 mo. 11 da. 7 h. 5 min.

3 20 15 21

21 da. 15 h. 44 min., *Ans.*

NOTE.—Borrow 31 days for March.

Ex. 13. The point of time divides the whole 12 hours into two intervals, which are in the ratio of 9 to 11. Hence, by Partnership,

9
 11

 $20 : 9 :: 12 \text{ h.} : () = 5 \text{ h. } 24 \text{ min.}, \text{ } \textit{Ans.}$

Ex. 14. The least common multiple of 63, 42 and $31\frac{1}{2}$; or, since 63 is 2 times $31\frac{1}{2}$, the least common multiple of 63 and 42, which is 126, *Ans.*

Ex. 15. The least common multiple of 8, 9, 15 and 16, which is 720, *Ans.*

Ex. 16. Since B gets in debt \$10 yearly, his income would enable him to spend $\$30 - \$10 = \$20$ a year more than A spends. Hence \$20 is $\frac{1}{8}$ of the income; and

$\$20 \times 8 = \160 , income, *Ans.*

Ex. 17. $\$2.19 \times 1\frac{1}{8} = \2.40 , *Ans.*

Ex. 18. $\left. \begin{array}{l} 2\frac{1}{2} \\ 1\frac{2}{5} \end{array} \right\} : \left. \begin{array}{l} 36\frac{1}{2} \\ 1\frac{1}{2} \end{array} \right\} :: \$3.37\frac{2}{5} : () = \52.779 , *Ans.*

Ex. 19. $\$1000 : \$200 :: 6 \text{ mo.} : () = 1\frac{1}{5} \text{ mo.}, \text{ } \textit{Ans.}$

Ex. 20. $\$2356.80 \div .40 = \5892 , left;
 $\$5892 + \$2356.80 = \$8248.80$, *Ans.*

Ex. 21. $\frac{1\frac{2}{3}\% \text{ of } \frac{2}{3}}{\frac{2}{3}} = 1\frac{2}{3}\% \times \frac{2}{3} \times \frac{3}{2} = 1\frac{2}{3} = 12\frac{1}{3}$ per cent., *Ans.*

Ex. 22. 1 private has 1 share; 60 privates have 60 shares
 1 subaltern " 2 " 6 subalterns " 12 "
 1 lieut. " 6 " 3 lieut's " 18 "
 1 commander has 12 "

All have 102 shares.

$\$10200 \div 102 = \100 , share of a private.

$\$100 \times 12 = \1200 , share of the commander.

Ex. 23. $19 - 16 = 3$; $51 \div 3 = 17$ hours, *Ans.*

Ex. 24. $40 \left\{ \begin{array}{c|c|c|c|c|c|c} 20 & \frac{1}{2} & 14 & 14 & 7 & 133 \\ 30 & & & 10 & 10 & 5 & 95 \\ 50 & & & 10 & 10 & 5 & 95 \\ 54 & \frac{1}{4} & 20 & 20 & 10 & 190 \end{array} \right\}$ *Ans.*

Ex. 25. $\$33.75 \div 22.5 = \1.50 , selling price per bu.

$\$22.50 \div 18 = \1.25 , buying " "

$\$.25$, profit on 1 "

$\$.25 \times 240 = \60 , *Ans.*

Ex. 26. The wagon is worth 4 times the harness; the horse is worth 8 times the harness; hence the horse, wagon and harness together are worth $8 + 4 + 1 = 13$ times the harness. Therefore, $\$169 \div 13 = \13 , harness, *Ans.*

Ex. 27. 18 in : 42 ft. :: 40 in. : () = $93\frac{1}{3}$ ft., *Ans.*

Ex. 28. 25 rd. : 40 rd. :: 4 rd. : () = $6\frac{2}{5}$ rd., *Ans.*

Ex. 29. $\frac{2}{3}$, $\frac{1}{5}$, and $\frac{1}{2} = \frac{1}{10}$, $\frac{1}{3}$, and $\frac{1}{5}$.

And since fractions having a common denominator are proportional to their numerators, we have

15 shares for A and B;

18 " " A " C;

13 " " B " C;

46, twice the number of shares for A, B and C.

$46 \div 2 = 23$ shares for A, B, and C.

$23 - 13 = 10$ " " A;

$23 - 18 = 5$ " " B;

$23 - 15 = 8$ " " C.

$$\left. \begin{array}{l} \$26.45 \times \frac{1}{2} = \$11.50, \text{ A's portion;} \\ \$26.45 \times \frac{1}{3} = \$ 8.82, \text{ B's " } \\ \$26.45 \times \frac{1}{5} = \$ 5.29, \text{ C's " } \end{array} \right\} \text{Ans.}$$

Ex. 30. $\frac{2\frac{1}{2}}{6} \left\{ : \frac{150}{4} \right\} :: 12 : () = 480 \text{ oz.} = 30 \text{ lb. Ans.}$

Ex. 31. $\$6300 \times \frac{1}{7} = \$ 900$, A's,

$\$6300 \times \frac{1}{5} = \1260 , B's;

$\$6300 \times \frac{2}{7} = \1800 , C's;

$\$900 + \$1800 = \$2700$, D's;

$\$5860$

$\$6300 - \$5860 = \$440$

$\$440 \times \frac{2}{5} = \176 , E's,

$\$440 \times \frac{3}{5} = \264 , F's.

Ex. 32. $\$200 \times 1.593848 = \$318.769 +$, Ans.

Ex. 33. At the time of the dismissal, the provisions on hand would supply 360 men 1 month; they would supply as many men 5 months.

Hence $360 \div 5 = 72$, the number that remained;

$360 - 72 = 288$, dismissed, Ans.

Ex. 34. \$1.338226 = amt. of \$1 at compound int. for 5 yrs.
at 6 per cent.

$$\$669.113 \div 1.338226 = \$500, \text{ principal.}$$

$$\$669.113 - \$500 = \$169.113, \text{ interest.}$$

$$\$500 \times .06 = \$30, \text{ simple int. of } \$500, \text{ for 1 year}$$

$$\text{at 6 per cent.}$$

$$169.113 \div 30 = 5.6371 \text{ yr.} = 5 \text{ yr. 7 mo. } 19.356 + \text{da., Ans.}$$

Ex. 35. $\$148.352 \div 9.728 = \$15.25, \text{ Ans.}$

Ex. 36. It is evident that the product of two numbers must contain each common factor to the two numbers twice, and each factor not common once.

$$483 \div 23 = 21, \text{ product of the factors not common.}$$

$$23 \times 23 \times 21 = 11109, \text{ Ans.}$$

Ex. 37. $\left. \begin{array}{l} 8 \\ 7 \\ 15 \end{array} \right\} : \left. \begin{array}{l} 12 \\ 9 \\ () \end{array} \right\} :: 1 : 2$

12	2
9	8
()	15
9	140

$15\frac{1}{2}, \text{ Ans.}$

Ex. 38. $\left. \begin{array}{l} 36 \\ 9 \end{array} \right\} : \left. \begin{array}{l} 60 \\ 27 \end{array} \right\} :: \left. \begin{array}{l} 36 \\ 1 \end{array} \right\} : \left. \begin{array}{l} () \\ 1\frac{1}{4} \end{array} \right\}$

Ans. 144 yards.

Ex. 39. $1 \times 4 = 4, \text{ A's product;}$
 $3 \times 2 = 6, \text{ B's "}$
 $7\frac{1}{2} \times 1 = 7\frac{1}{2}, \text{ C's "}$

$$\underline{17\frac{1}{2}}$$

$$17\frac{1}{2} : 4 :: \$52.50 : () = \$12, \text{ A's share;}$$

$$17\frac{1}{2} : 6 :: \$52.50 : () = \$18, \text{ B's share;}$$

$$17\frac{1}{2} : 7\frac{1}{2} :: \$52.50 : () = \$22.50, \text{ C's share.}$$

Ex. 40. $\frac{2}{3}$ and $\frac{4}{5} = \frac{4}{3}$ and $\frac{4}{5}$.

$$4 + 5 = 9.$$

$$9 : 4 :: \$45 : () = \$20, \text{ A's;}$$

$$9 : 5 :: \$45 : () = \$25, \text{ B's.}$$

Ex. 41. \$.35, interest of \$1 for 5 years at 7 per cent.;
 $\$33.25 \div .35 = \95 , *Ans.*

Ex. 42. $6 \times \sqrt[3]{\frac{4}{3}} = 6 \times \sqrt[3]{\frac{1}{\frac{3}{4}}} = 6 \times \frac{1}{\frac{3}{4}} = 3$, *Ans.*

Ex. 43. $2 + 3 + 4 = 9$.
 $9 : 2 :: \$360 : () = \80
 $9 : 3 :: \$360 : () = \120
 $9 : 4 :: \$360 : () = \160 } *Ans.*

Ex. 44. $8\frac{1}{2} : 6\frac{2}{3} :: 12\frac{1}{2} : () = 9\frac{2}{3}$, *Ans.*

Ex. 45. $9 \times 9 = 81$ sq. in. in 1 stone;
 $144 \times 9 = 1296$ sq. in. in 1 sq. yd.;
 $1296 \div 81 = 16$ stones for 1 sq. yd.;
 $16 \times 40 = 640$, *Ans.*

Ex. 46. $1.00 - .08 = .92$; $\$23 \div .92 = \25 , cost of the calves and sheep sold. Since the price multiplied by the quantity gives the cost, we have these two conditions, viz.; 3 times the number of calves, plus 2 times the number of sheep, equals 76; and $3 \times \frac{1}{4} = \frac{3}{4}$ of the number of calves, plus $2 \times \frac{1}{2} = 1$ of the number of sheep, equals 25. Expressing these conditions, as in Analysis, page 294, we have

	c.	s.	
1st condition	3	2	76
2d condition	$\frac{3}{4}$	$\frac{1}{2}$	25
$2d \times 4 =$	3	$\frac{1}{2}$	100
Subtract the 1st from the 3d =		$\frac{1}{2}$	24

That is, $\frac{1}{2}$ of the sheep are equal to 24; hence

$24 \div \frac{1}{2} = 20$, number of sheep.

$76 - (2 \times 20) = 36$; $36 \div 3 = 12$, number of calves.

Ex. 47. $17\frac{1}{2} \left\{ \begin{array}{l} 16 \\ 10\frac{1}{2} \\ 19 \end{array} \right\} : 7 \left\{ \begin{array}{l} 16 \\ 7 \\ 15 \end{array} \right\} :: 546 : () = 384$, *Ans.*

$$\text{Ex. 48. } \left. \begin{array}{l} 12 \\ 15\frac{1}{2} \\ 9 \end{array} \right\} : \left. \begin{array}{l} () \\ 15 \\ 7 \end{array} \right\} :: 2 : 1.$$

Reducing the statement, $() = 8$, the number of men required to finish the job.

$$12 - 8 = 4 \text{ men withdrawn.}$$

Ex. 49. It is evident that to increase the number in both rank and file by 1 man, would require twice the number in rank or file at first, plus 1 (for the man at the corner). And since to effect this, required $59 + 84 = 143$ men, $143 - 1 = 142$ is the number of men in rank or file at first. Hence

$$71^2 + 59 = 5100 \text{ men under command, } \textit{Ans.}$$

Ex. 50. Cost of the corn was 2 times the cost of the barley

“ “ wheat “ 4 “ “ “ “

Cost of corn and wheat “ 6 “ “ “ “

Hence, cost of barley was $\frac{1}{3}$ of the cost of corn and wheat.

Again,

Wheat cost $\$243 + \frac{1}{3}$ of the whole.

Corn “ $153 + \frac{1}{3}$ “ “

Wheat and corn “ $\$396 + \frac{1}{3}$ “ “

Barley “ $66 + \frac{1}{3}$ “ “ ($\frac{1}{3}$ of w. & c.)

Cost of the whole was $\$462 + \frac{1}{3}$ “ “

Hence, $\$462$ was $\frac{1}{3} - \frac{1}{3} = \frac{1}{3}$ of the whole cost.

And $\$462 \div \frac{1}{3} = \756 , the whole cost.

And since the barley, corn, and wheat cost in the proportion of 1, 2, and 4, we have

$$1 + 2 + 4 = 7$$

$\$756 \times \frac{1}{7} = \108 , cost of barley; $\$108 \div \$.60 = 180$ bu. barley;

$\$756 \times \frac{2}{7} = \216 , cost of corn; $\$216 \div \$.75 = 288$ bu. corn;

$\$756 \times \frac{4}{7} = \432 , cost of wheat; $\$432 \div \$1.50 = 288$ bu. wheat;

Ans. 756 bu. grain.

Ex 51 As often as the first has 1,
 " second " $\frac{2}{3}$,
 and " third " $\frac{1}{2}$ of $1\frac{2}{3} = \frac{5}{3}$;
 1, $\frac{2}{3}$, and $\frac{5}{3} = \frac{2}{3}, \frac{2}{3}$, and $\frac{5}{3}$.

We therefore assume 8 as the proportional number for the first;

6 " " " second;
 and 7 " " " third

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$$\left. \begin{aligned} \$630 \times \frac{2}{3} &= \$240, \text{ 1st;} \\ \$630 \times \frac{2}{3} &= \$180, \text{ 2d;} \\ \$630 \times \frac{5}{3} &= \$210, \text{ 3d.} \end{aligned} \right\} \text{Ans.}$$

Ex. 52. $\$28 \times 1.20 = \33.60 what the 56 remaining gal-
 lons must be sold for. $\$33.60 \div 56 = \$.60$, Ans.

Ex. 53. $\frac{\frac{2}{100} \times \frac{1}{2}}{2 \times \frac{1}{2} \text{ of } 1\frac{1}{2}} = \frac{20}{100} \times \frac{4}{5} \times \frac{1}{2} \times \frac{4}{3} \times \frac{2}{3} = \frac{16}{225} = .07\frac{1}{3}$, Ans.

Ex. 54. $\$3500 - \$2100 = \$1400$, what B owns now;
 $\$1400 \div 1.40 = \1000 , B put in;
 $\$2100 \div 1.40 = \1500 , C put in.

Ex. 55. $\sqrt{8^2 + 16^2} = 17.88 + \text{ft.}$, Ans.

Ex. 56. $\left. \begin{array}{l} 12 \\ 12 \\ 12 \end{array} \right\} : \left. \begin{array}{l} 10 \\ 9 \\ 8 \end{array} \right\} :: \left. \begin{array}{l} 75 \\ \frac{75}{2} \\ \frac{75}{4} \end{array} \right\} : \left(\begin{array}{l} \\ \\ 1 \end{array} \right) \left. \right\} \text{Ans. } 23\frac{7}{8}.$

Ex. 57. $\$12 \div 1.09 = \$11.0091 +$, worth of sugar;
 $\$12 - \$11.0091 = \$.9909 +$, grocer's profit;
 $\$6 \div 1.10 = \$5.4545 +$, worth of beef;
 $\$6 - \$5.4545 = \$.5455 +$, farmer's profit;
 $\$.9909 - \$.5455 = \$.445 +$, grocer gains more.

Ex. 58. $\$336.42 - \$311.50 = \$24.92$, interest;
 $\$4.15\frac{1}{2}$ int. of $\$311.50$ for 1 yr. 4 mo. at 1 per cent.
 $\$24.92 \div \$4.15\frac{1}{2} = 6$ per cent., Ans.

Ex. 59. $\frac{4}{3}$, $\frac{2}{3}$, and $\frac{2}{5} = \frac{12}{15}$, $\frac{10}{15}$, and $\frac{6}{15}$.

These fractions are to each other as their numerators, 12, 10, and 6; and these numerators are to each other as 6, 5, and 3.

Hence, we have 6 shares for A and B;

5 shares for A and C;

3 shares for B and C.

14, twice the number of shares for A, B, and C.

$14 \div 2 = 7$ shares for A, B, and C.

$7 - 3 = 4$ shares for A;

$7 - 5 = 2$ shares for B;

$7 - 6 = 1$ share for C.

Hence $\$20 \times \frac{4}{1} = \$11\frac{2}{3}$, A's;

$\$20 \times \frac{2}{1} = \$5\frac{1}{3}$, B's;

$\$20 \times \frac{1}{1} = \$2\frac{2}{3}$, C's.

Ex. 60. $\$375 \div .025 = \15000 , Ans.

Ex. 61. Interest commenced Apr. 1, 1857.

Amt. of note July 1, 1857, (3 mo.).....\$1015

Payment, 560

New Principal,\$ 455

Amt., Dec. 1, 1857, (5 mo.)..... 466.37 +

Payment,..... 406

New Principal,.....\$ 60.37 +

Amt., Aug. 23, 1859, (1 yr. 8 mo. 22 da.)..\$ 66.63 +,

Ans.

Ex. 62. B has $\frac{2}{3} \times \frac{1}{2}$ of A's $= \frac{1}{3}$ of A's;

C has $\frac{2}{3} \times \frac{1}{2}$ of B's $= \frac{2}{3} \times \frac{1}{3} \times \frac{1}{2}$ of A's $= \frac{1}{9}$ of A's;

D has $\frac{2}{3} \times \frac{1}{2}$ of C's $= \frac{2}{3} \times \frac{1}{3} \times \frac{1}{9}$ of A's $= \frac{1}{27}$ of A's

And since D has \$45 more than C,

$\frac{1}{27}$ of A's $-\frac{1}{9}$ of A's $= \$45$; or $\frac{1}{27}$ of A's $= \$45$.

Hence $\$45 \div \frac{1}{27} = \378 , A's;

$\$378 \times \frac{1}{3} = \336 , B's;

$\$378 \times \frac{1}{9} = \360 , C's;

$\$378 \times \frac{1}{27} = \405 , D's.

Ans.

Ex. 63. B had the use of \$300 for 27 months before it was due, which was equivalent to the use of \$1 for $27 \times 300 = 8100$ months. But the use of \$1 for 8100 months is equal to the use of \$600 for $\frac{1}{6}\frac{1}{6}\frac{1}{6} = 13\frac{1}{2}$ months, the time he should wait.

Ex. 64. His savings and expenses together, or his salary is $\frac{1}{11} + \frac{1}{11} = \frac{2}{11}$ of what he saves; hence $\$800 = \frac{2}{11}$ of what he saves; and $\$800 \div \frac{2}{11} = \550 , *Ans.*

Ex. 65. $\$.87\frac{1}{2} = \$.7$; $\$1.00 \div 1.10 = \$.909$, cost per yd.;
 $\$.909 - \$.7 = \$.209$, loss at $\$.87\frac{1}{2}$ per yd.;
 $\frac{.209}{.7} \div \frac{2}{11} = \frac{.209}{.7} \times \frac{11}{2} = .033 = 3\frac{3}{4}$ per cent., *Ans.*

Ex. 66. $\frac{21\frac{9}{11}}{29\frac{1}{11}} = \frac{249}{320} = \frac{240}{320} = \frac{3}{4}$; $\left(\frac{3}{4}\right)^2 = \frac{27}{64}$, *Ans.*

Ex. 67. $\frac{63}{149\frac{1}{3}} = \frac{189}{448} = \frac{27}{64}$; $\sqrt{\frac{27}{64}} = \frac{3}{4}$, *Ans.*

Ex. 68. $50 \left\{ \begin{array}{c|c|c|c|c|c|c|c} 20 & \frac{1}{30} & & 20 & & 2 & & 2 & 20 \\ 35 & & \frac{1}{15} & & 10 & & 2 & & 20 \\ 60 & & \frac{1}{10} & & 15 & & 3 & & 30 \\ 70 & \frac{1}{30} & & 30 & & 3 & & 3 & 30 \\ \hline & & & & & & & 10 & 100 \end{array} \right.$

Ans. 20 of oats and corn, and 30 of rye and wheat.

Ex. 69. $\frac{40 + 500}{2} = 270$, half the sum of the extremes.

And since the sum of all the terms is equal to half the sum of the extremes multiplied by the number of terms, $6480 \div 270 = 24$, the number of creditors.

$500 - 40 = 460$, difference of extremes.

$\$460 \div 23 = \20 , common difference.

Ex. 70. $\sqrt{128^2 + 72^2} = 146.86 +$, *Ans.*

Ex. 71. If 7 pounds of butter are equal to 10 pounds of cheese, 11 pounds of butter are equal to $\frac{11}{7}$ of 10 pounds of cheese; and if 2 bushels of corn are equal to 11 pounds of butter, 14 bushels of corn are equal to $\frac{14}{2}$ of 11 pounds of butter, or $\frac{14}{2} \times \frac{11}{7}$ of $\frac{11}{7}$ of 10 pounds of cheese; and if 8 bushels of rye are equal to 14 bushels of corn, 4 bushels of rye are equal to $\frac{4}{8}$ of 14 bushels of corn, or $\frac{4}{8}$ of $\frac{14}{2}$ of $\frac{11}{7}$ of 10 pounds of cheese; and, finally, if 1 cord of wood is equal to 4 bushels of rye, 10 cords of wood are equal to 10 times 4 bushels of rye, or $\frac{10}{1}$ of $\frac{4}{8}$ of $\frac{14}{2}$ of $\frac{11}{7}$ of 10 pounds of cheese = 550 pounds of cheese, *Ans.*

$$\begin{array}{r|l} 7 & 10 \\ & 11 \\ 2 & 14 \\ 8 & 4 \\ \hline & 10 \\ & 550, \text{ Ans.} \end{array}$$

NOTE.—Instead of the fractional form the vertical line may be used, as above.

Ex. 72. $\$18 \div \frac{1}{2} = \45 A's gain.
 $\frac{1}{2} : \frac{1}{3} :: \$45 : () = \$37.50$, B's gain.
 $\$45 \div .06 = \750 , A's stock;
 $\$37.50 \div .06 = \625 , B's stock

Ex. 73. $\left. \begin{array}{l} 20 \\ 21 \\ 10 \end{array} \right\} : \left(\begin{array}{l} () \\ 25 \\ 8 \end{array} \right) :: \left. \begin{array}{l} 30 \\ 15 \\ 12 \\ 3 \end{array} \right\} : \left(\begin{array}{l} 45 \\ 16 \\ 18 \\ 5 \end{array} \right)$

Reducing the statement, we have

$$() = 84, \text{ Ans.}$$

Ex. 74. $2\frac{3}{4} : 27\frac{1}{2} :: 10 \text{ ft.} : () = 103\frac{1}{2} \text{ ft.}$, *Ans.*

Ex. 75. A can do $\frac{1}{3}$ of the work in 1 day;

B " $\frac{2}{3}$ " " " 1 "

C " $\frac{1}{3}$ " " " 1 "

They all " $\frac{1}{3} + \frac{2}{3} + \frac{1}{3} = 1$ of the piece in 1 day.

Hence it will require $1 \div 1 = 1$ of a day.

Ex. 76. $\$1890 \div 1.25 = \1512 , true value of 1st.

$\$1890 \div .75 = \2520 , " " " 2d.

$\$4032$, " " " both

$\$1890 \times 2 = \3780 , received for both.

Ans. \$ 252, lost.

Ex. 77. If C paid one half the cost, A and B together paid \$50. Since 6 cows eat as much as 4 horses, 12 cows eat as much as 8 horses. Therefore, A put in 9 horses for 1 unit of time, and B put in the same as 8 horses for 2 units of time. Hence,

A's use of the pasture was $9 \times 1 = 9$ horses for 1 unit of time ;

B's " " " " $8 \times 2 = 16$ " " 1 " " "

A and B's use of the pasture was $= 25$, " " 1 " " "

$\$50 \times \frac{2}{5} = \18 , A paid ;

$\$50 \times \frac{3}{5} = \32 , B paid.

Again, C's time was $2\frac{1}{2}$ times B's time, or $2 \times 2\frac{1}{2} = 5$ units of time. And since C paid half the cost, his use of the pasture must have been as much as A's and B's together, which is 25 horses for 1 unit of time ; and this is equal to 5 horses for C's 5 units of time. Now the pasturage of 1 horse is $\frac{2}{3}$ times the pasturage of 1 cow, and the pasturage of 1 cow is $\frac{1}{3}$ times the pasturage of one sheep ; hence the pasturage of 5 horses (for which C paid) is $\frac{1}{3} \times \frac{2}{3} \times 5 = 25$ times the pasturage of 1 sheep. Therefore C put in 25 sheep.

Ex. 78

$\$3500 \div 1.0175 = \$3439.803 +$, pres. worth of 1st installment;

$\$3500 \div 1.02\frac{1}{2} = \$3420.195 +$, " " 2d "

$\$3500 \div 1.04\frac{2}{3} = \$3343.949 +$, " " 3d "

$\$10203.947 +$, Ans.

Ex. 79. Had the farmer sold both geese and turkeys at \$.75 apiece, the 50 fowls would have brought $\$.75 \times 50 = \37.50 ,

which is $\$52.50 - \$37.50 = \$15$ less than they really brought; consequently the difference between the two estimates of the turkeys, reckoned at $\$.75$ and $\$1.25$ apiece, is $\$15$. Hence, $\$1.25 - \$.75 = \$.50$; $\$15 \div \$.50 = 30$, the number of turkeys; and $50 \div 30 = 20$, the number of geese.

Ex. 80. B gains of A 3 miles an hour, and C 5 miles an hour. Hence B will pass A every $\frac{1}{3}$ hours = 24 h. 20 min. = 1460 min.; and C will pass A every $\frac{1}{5}$ hours = 14 h. 36 min. = 876 min. Now the least common multiple of 1460 and 876 will express the number of minutes in which B and C will first pass A together.

$$\begin{array}{r|l} 2, 2 & 1460 \dots 876 \\ 73 & 365 \dots 219 \\ \hline 5, 3 & 5 \dots 3 \end{array}$$

$$2 \times 2 \times 73 \times 5 \times 3 = 4380 \text{ min.} = 6 \text{ da. 1 h., } \textit{Ans.}$$

Ex. 81. $\frac{1}{3}$, $\frac{1}{4}$ and $\frac{1}{5} = \frac{2}{6}$, $\frac{1}{4}$ and $\frac{1}{5}$.

And since fractions having a common denominator are to each other as their numerators, A, B and C were to share in the proportion of 20, 15 and 12. But C dying, his 12 parts must be shared by A and B in the proportion of 20 and 15, or 4 and 3. $4 + 3 = 7$.

$7 : 4 :: 12 : () = 6\frac{2}{7}$, A's share of C's 12 parts;

$7 : 3 :: 12 : () = 5\frac{1}{7}$, B's " " " " "

$20 + 6\frac{2}{7} = 26\frac{2}{7}$, A's number of parts of the money;

$15 + 5\frac{1}{7} = 20\frac{1}{7}$, B's " " " " "

$47 : 26\frac{2}{7} :: \$100000 : () = \$57142.85\frac{2}{7}$, A's, }

$47 : 20\frac{1}{7} :: \$100000 : () = \$42857.14\frac{1}{7}$, B's, } *Ans.*

Ex. 82. A's + B's = 5

C's + B's = 7

C's - B's = 1

$\frac{7+1}{2} = 4$, C's proportion;

$7 - 4 = 3$, B's "

$5 - 3 = 2$, A's "

Since A's + B's are to B's + C's as 5 to 7, A and B together have 5 as often as B and C together have 7. And since C's - B's are to C's

+ B's as 1 to 7, 7 is the sum and 1 the difference of B and C's proportionate shares. Hence we find the proportionate share of each. Then

$2 + 3 + 4 = 9$, the sum of their proportions.

And A has $\frac{2}{9}$ of $135 = 30$ sheep;

B " $\frac{3}{9}$ " $135 = 45$ "

C " $\frac{4}{9}$ " $135 = 60$ "

Ex. 83. $250 \times 4 = 1000$

$300 \times 4\frac{1}{2} = 1350$

$369 \times 5 = 1845$

919 4195

$4195 \div 919 = 4\frac{5}{9} + \frac{1}{9}$, Ans.



Ex. 84. The relative values of the work performed by one of each class, in the same number of days, are as follows :

$$\begin{array}{lcl} 1 \text{ boy} & 3 \times 8 = 24 & \\ 1 \text{ woman} & 4 \times 9 = 36 & \\ 1 \text{ man} & 6 \times 12 = 72 & \end{array} \left. \vphantom{\begin{array}{l} 1 \text{ boy} \\ 1 \text{ woman} \\ 1 \text{ man} \end{array}} \right\} \text{or } \left\{ \begin{array}{l} 2 \\ 3 \\ 6 \end{array} \right.$$

The relative amounts of wages received by the whole number of boys, women and men, in the same number of days, are as follows :

Boys, \$5 ; women, \$10 ; men, \$24.

Hence the proportions of boys, women and men are expressed by the following quotients:

$5 \div 2 = 2\frac{1}{2}$ boys ;

$10 \div 3 = 3\frac{1}{3}$ women ;

$24 \div 6 = 4$ men.

$9\frac{1}{6}$

$9\frac{1}{6} : 2\frac{1}{2} :: 59 : () = 15 \text{ boys ;}$

$9\frac{1}{6} : 3\frac{1}{3} :: 59 : () = 20 \text{ women ;}$

$9\frac{1}{6} : 4 :: 59 : () = 24 \text{ men.}$

Ex. 85. A, B and C fill $\frac{1}{3}$ of it in 1 hour ;

B, C " D " $\frac{1}{4}$ " " "

C, D " A " $\frac{1}{5}$ " " "

D, A " B " $\frac{1}{6}$ " " "

A, B, C and D fill $\frac{1}{3}$ of $\frac{47}{120} = \frac{19}{30}$ of it in 1 hour.

W, X and Y empty $\frac{1}{3}$ of it in 1 hour ;

X, Y " Z " $\frac{1}{4}$ " " "

Y, Z " W " $\frac{1}{5}$ " " "

Z, W " X " $\frac{1}{6}$ " " "

W, X, Y and Z empty $\frac{1}{3}$ of $\frac{11}{12} = \frac{11}{12}$ of it in 1 hour.

$\frac{19}{30} - \frac{11}{12} = \frac{1}{20}$, the emptying pipes gain of the filling pipes in 1 hour. Therefore, to exhaust the fountain will require $120 \div 19 = 6\frac{6}{19}$ hours, *Ans.*

Ex. 86. 1 A. 1 R. 6 P. $18\frac{1}{2}$ sq. yd. = 56250 sq. ft. ;

$$\frac{56250}{75 \times 125} = 6, \text{ } Ans.$$

Ex. 87. \$ 1 \times 0 = \$ 0

$$2 \times 1 = 2$$

$$4 \times 2 = 8$$

$$8 \times 3 = 24$$

$$16 \times 4 = 64$$

$$32 \times 5 = 160$$

$$64 \times 6 = 384$$

$$128 \times 7 = 896$$

$$256 \times 8 = 2048$$

$$512 \times 9 = 4608$$

$$1024 \times 10 = 10240$$

$$2048 \times 11 = 22528$$

Cost, \$4095. \$40962, sum of products.

$40962 \div 4095 = 10$ mo., average term of credit.

Jan. 1 + 10 mo. = Nov. 1, average time.

Ex. 88. $44.32 \times 36 = 1595.52$ sq. ch. = 159 A. 2 R. 8.32 P.

Ans.

Ex. 89 $1 + \frac{1}{2} + \frac{1}{3} = 1\frac{5}{6}$. That is, if a number be increased by $\frac{1}{2}$ and $\frac{1}{3}$ of itself, the result will be $1\frac{5}{6}$ times the number. Hence, by the conditions, $1\frac{5}{6}$ times the number, plus 18, is equal to 2 times the number; consequently, 18 is $2 - 1\frac{5}{6} = \frac{1}{6}$ of the number, and $18 \times 6 = 108$ is the number.

Ex. 90. If that which is worth $\$.62\frac{1}{2}$ be rated at $\$.56$, what ought that which is worth $\$.25$ be rated at?

$$$.62\frac{1}{2} : $.25 :: $.56 : () = $.224$$

Therefore, in the barter for a pound of coffee at $\$.22$, the merchant obtains that which is worth, ratably, $\$.224$; hence he gains $\$.004$ on $\$.22$; and $\$.004 \div \$.22 = .01\frac{2}{11}$, *Ans.*

ANOTHER SOLUTION.

A pound of tea, in the barter, will buy $56 \div 22 = 2\frac{8}{11}$ pounds of coffee; and this is worth $$.25 \times 2\frac{8}{11} = \$.63\frac{7}{11}$. But the pound of tea given is worth $\$.62\frac{1}{2}$; and $\$.63\frac{7}{11} - \$.62\frac{1}{2} = \$.01\frac{2}{11}$, the gain on $\$.62\frac{1}{2}$. Hence, $1\frac{2}{11} \div 62\frac{1}{2} = .01\frac{2}{11}$, the gain per cent.

Ex. 91. First find how much ready money will cancel a debt of \$1, due in 4 equal installments, for the times and at the rate mentioned.

$$$.25 \div 1.01\frac{3}{4} = $.245901 +, \text{ pres. worth of 1st installment;}$$

$$$.25 \div 1.0375 = $.240965 +, \quad " \quad " \quad 2d \quad "$$

$$$.25 \div 1.05 = $.238095 +, \quad " \quad " \quad 3d \quad "$$

$$$.25 \div 1.08\frac{1}{2} = $.230769 +, \quad " \quad " \quad 4th \quad "$$

$$\begin{array}{r} \$1.00 \\ \hline \$.955730 +, \text{ present worth of } \$1. \end{array}$$

Now if \$1, payable as by the conditions named, be worth $\$.95573$ in ready money, what sum will be worth, in ready money, \$750, on the same conditions?

$$\$1 : () :: \$750 : \$.95573 ; \$784.74 +, \text{ Ans.}$$

Ex. 92. $\frac{1}{2} - \frac{1}{4} = \frac{1}{4}$ of the capital of either must be equal to \$500. Therefore $\$500 \times 8 = \4000 , *Ans.*

Ex. 93.

Due.		da.	Items.	Prod.
Dec.	4	00	240.75	
Feb.	9	67	137.25	9195.75
Feb.	29	87	65.64	5710.68
March	4	91	230.36	20962.76
May	12	160	36.00	5760.00
			710.00	41629.19

$41629.19 \div 710 = 59$ da., average term of credit.

Dec. 4, 1859 + 59 da. = Feb. 1, 1860, *Ans.*

Ex. 94. When he had spent $\frac{1}{4}$ of his fortune, he had $\frac{3}{4}$ left. $\frac{3}{4}$ of $\frac{3}{4} = \frac{9}{16}$. He had spent, in all, $\frac{1}{4} + \frac{9}{16} = \frac{13}{16}$ of his fortune; consequently, the \$2524 which he had left was $\frac{3}{16}$ of his fortune. $\$2524 \div \frac{3}{16} = \$5889.33 +$, whole fortune, *Ans.*

Ex. 95. By the conditions, the payments consist of five several parts or installments of the \$3000 and interest on the first part or installment for 1 yr., on the second installment for 2 yr., on the third for 3 yr., on the fourth for 4 yr., and on the fifth for 5 yr.; and the payments, each of which consists of the sum of one installment and its interest, are equal to each other. That is, the amount of first installment for 1 yr. = amount of second installment for 2 yr. = amount of third payment for 3 yr., and so on. But, as the payments are made annually, the interest must be added to the principal at the end of each year; consequently the second year's interest is less than the first by the interest on the first installment, and the second installment must exceed the first by this interest, or by .07 times the first; therefore, the second installment = 1.07 times the first. For similar reasons the third installment = 1.07 times the second, = 1.07×1.07 times the first, and so on to the last. Hence, the installments form a Geometrical Series, of which

1st installm.=1st term ; 5, (numb. of paym'ts)=No. of terms ;
 1.07 =ratio ; and \$3000 =sum of the series.

That is, we have the ratio, the number of terms, and the sum of the series, to find the first term.

$$\frac{\$3000 \times (1.07 - 1) \cdot 07}{(1.07)^5 - 1} = \text{1st term} = \$521.674 + ;$$

\$521.674 (1st installment) + \$210 (int. on \$3000 for 1 yr.)
 = \$731.674, annual payment, *Ans.*

Ex. 96.

Due.	mo.	Items.	Prod.
Jan. 1, 1859	0	200	
Sept. 1, "	8	350	2800
Apr. 1, 1860	15	500	7500
		1050	10300

$$10300 \div 1050 = 9 \text{ mo. } 24 \text{ da.}$$

Jan. 1, 1859 + 9 mo. 24 da. = Oct. 24, 1859, *Ans.*

Ex. 97. Make the notes given the Dr. side of an account, and the note received the Cr. side ; the balance will be the other note received, and the average maturity, its date.

Dr.

Cr.

Due.	da.	Items.	Prod.	Due.	da.	Items.	Prod.
July 7, 1859	00	600		Nov. 15, 1859	131	730	95630
Oct. 4, "	89	530	47170				
Feb. 20, 1860	228	400	91200				
		1530	138370			730	95630
		730	95630				
Balances		800	42740				

$$42740 \div 800 = 53 \text{ da.}$$

July 7 + 53 da. = Aug. 29, 1859, note due.

MENSURATION OF LINES AND SURFACES.

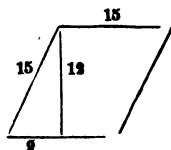
(466, page 342.)

Ex. 1. $3 \times 12 = 36$ inches long; $36 \times 20 = 720$, *Ans.*Ex. 2. $\frac{\$32 \times 198 \times 150}{160} = \5940 , *Ans.*Ex. 3. $\frac{1000 \times 100}{10000} = 10$ A., *Ans.*

(469, page 343.)

Ex. 1. $20 \times 12 = 240$ sq. ch.; $240 \times 16 = 3840$ sq. rd. in the meadow, requiring 3840 min. for mowing. 3840 min. = 6 da. 4 h., *Ans.*

Ex. 2.

 $\sqrt{15^2 - 9^2} = 12$, the perpendicular; $15 \times 12 = 180$ sq. ft., *Ans.*

(471.)

Ex. 1. $\frac{16 + 9}{2} = 12\frac{1}{2}$ in. = $1\frac{1}{4}$ ft., average width ; $12 \times 1\frac{1}{4} = 12\frac{1}{2}$ sq. ft., *Ans.*Ex. 2. $\frac{16 + 8}{2} = 12$ in. = 1 ft., mean width ; $1 \times 8 = 8$ sq. ft., *Ans.*Ex. 3. $\frac{40 + 22}{2} \times 25 = 775$ sq. ch. = 77 A. 5 sq. ch., *Ans.*

(475.)

Ex. 1. $1\frac{1}{2} \times 45 = 3330$ sq. ft. = 370 sq. yd., *Ans.*Ex. 2. The two ends together are equal to a rectangle, 28 feet by 7 feet; hence $28 \times 7 = 196$ sq. ft., *Ans.*

(479, page 344.)

Ex. 1. $5 \times 3.1416 = 15.708 \text{ ft.} = 15 \text{ ft. } 8.4 + \text{in.}, \text{ Ans.}$

Ex. 2. $721 \times 3.1416 = 2265.0936 \text{ rd.} = 7 \text{ mi. } 25 \text{ rd. } 1.54 + \text{ft}$
Ans.

Ex. 3. $33 \times .3183 = 10.5 + \text{yards}, \text{ Ans.}$

(480, page 344.)

Ex. 1. $\frac{113 \times 355}{4} = 10028.75, \text{ Ans.}$

Ex. 2. Reversing the rule (II.)
 $1 \text{ sq. mi.} \div .7854 = 1.2732 +, \text{ square of diameter.}$
 $\sqrt{1.2732} = 1.1284 + \text{mi.} = 1 \text{ mi. } 41 \text{ rd. } 1.4 + \text{ft.}$

Ex. 3. $84^2 \times .07958 = 561.5 + \text{P.} = 3 \text{ A. } 81.5 + \text{P.}, \text{ Ans.}$

METRIC SYSTEM.

REDUCTION DESCENDING.

(Page 444.)

- Ex. 1. $^3\text{M } 32.58 \times 1000000 = {}_3\text{M } 32580000$, *Ans.*
 Ex. 2. $^4\text{M } 5 \times 100000 = {}_1\text{M } 500000$, *Ans.*
 Ex. 3. $\text{G } 402 \times 1000 = {}_3\text{G } 402000$, *Ans.*
 Ex. 4. $^2\text{A } 42.3 \times 10000 = {}_2\text{A } 423000$, *Ans.*
 Ex. 5. $^3\text{L } 93.2 \times 10000 = {}_1\text{L } 932000$, *Ans.*
 Ex. 6. $^4\text{S } 895 \times 1000 = {}^1\text{S } 895000$, *Ans.*
 Ex. 7. $^2\text{A } 903.2 \times 100000 = {}_3\text{A } 90320000$, *Ans.*
 Ex. 8. $^1\text{G } 539 \times 1000 = {}_2\text{G } 539000$, *Ans.*
-

REDUCTION ASCENDING.

- Ex. 1. ${}_2\text{A } 5 \div 1000000 = {}^4\text{A } .000005$, *Ans.*
 Ex. 2. ${}_3\text{M } 403 \div 1000000 = {}^3\text{M } .000403$, *Ans.*
 Ex. 3. ${}_1\text{S } 42.3 \div 1000 = {}^2\text{S } .0423$, *Ans.*
 Ex. 4. ${}_3\text{A } 7.2 \div 10000 = {}^1\text{A } .00072$, *Ans.*
 Ex. 5. ${}_3\text{G } 3 \div 1000000 = {}^3\text{G } .000003$, *Ans.*
 Ex. 6. ${}_2\text{L } 5.7 \div 10000 = {}^2\text{L } .00057$, *Ans.*
 Ex. 7. ${}_3\text{M } 9 \div 10000000 = {}^4\text{M } .0000009$, *Ans.*
 Ex. 8. ${}_2\text{S } 47.3 \div 1000 = {}^1\text{S } .0473$, *Ans.*
-

MEASURE OF SURFACES.

(Page 447.)

- Ex. 1. $1.25 \times 8.7 = 10.875$ sq. M or ${}_2\text{A } 10.875$ *
 ${}_2\text{A } 10.875 \div 100 = \text{A } .10875$, *Ans.*
 Ex. 2. $\text{A } .10875 \times 100 = {}_2\text{A } 10.875$, *Ans. to first*
 $\text{A } .10875 \div 1000 = {}^3\text{A } .00010875$, *Ans. to second*
 $\text{A } .10875 \div 100 = {}^2\text{A } .0010875$, *Ans. to third*

* See Note under Rule, page 447, and preceding illustrations.

- Ex. 3. ${}_2M 47 \div 100 = M .47$
 $5.32 \times .47 = 2.5004$ sq. M or ${}_2A 2.5004 *$
 ${}_2A 2.5004 \div 100 = A .025004$, *Ans.*
- Ex. 4. $A .025004 \times 1000 = {}_3A 25.004$, *Ans.* to first
 $A .025004 \div 10000 = {}^4A .0000025004$, *Ans.* to second
 $A .025004 \div 100 = {}^2A .00025004$, *Ans.* to third
- Ex. 5. $5.4 \times 6 = {}_2A 32.4 *$
 $32.4 \div .9 = M 36$ length of carpet, *Ans.* to first
 $\$2.50 \times 36 = \90 , *Ans.* to second
- Ex. 6. $342 \times 273 = {}_2A 93363$, * area of first field
 $634 \times 350 = {}_2A 221900$, " " second field
 $450 \times 329 = {}_2A 148050$, " " third field
 $632.7 \times 730 = {}_2A 461871$, " " fourth field

 ${}_2A 925187$, total area
 ${}_2A 925187 \div 10000 = {}^2A 92.5187$, *Ans.*
- Ex. 7. ${}_1M 4 \div 10 = M .4$
 $4 \times .4 = {}_2A 1.6 *$
 ${}_2A 1.6 \times 150 = {}_2A 240$, area of boards of 1st dimensions
 ${}_2M 52 \div 100 = M .52$
 $6.2 \times .52 = {}_2A 3.224$ [mensions
 ${}_2A 3.224 \times 225 = {}_2A 725.4$, area of boards of 2d di-
 ${}_2M 43 \div 100 = M .43$
 $5.2 \times .43 = {}_2A 2.236$ [dimensions
 ${}_2A 2.236 \times 642 = {}_2A 1435.512$, area of boards of 3d
 ${}_2A 240 + {}_2A 725.4 + {}_2A 1435.512 = {}_2A 2400.912$
 ${}_2A 2400.912 \div 100 = A 24.00912$
 $\$42 \times 24.00912 = \$1008.38 +$, *Ans.*
- Ex. 8. ${}_1M 2.2 \div 10 = M .22$; ${}_1M 1.1 \div 10 = M .11$
 $.22 \times .11 = {}_2A .0242$, * area of one brick
 $842.6 \times 2.2 = {}_2A 1853.72$, area of walk
 ${}_2A 1853.72 \div {}_2A .0242 = 76600$, bricks, *Ans.* to first
 $\$.60 \times 1853.72 = \$1112.23 +$, *Ans.*

* See Note under Rule, page 447, and preceding illustrations.

MEASURE OF VOLUMES.

(Page 450.)

- Ex. 1. ${}_2M\ 5.2 \div 100 = M\ .52$
 $24 \times 8.5 \times .52 = S\ 106.08^*$
 $\$4.25 \times 106.08 = \$450.84, \text{ Ans.}$
- Ex. 2. $15.7 \times 3 \times 7.52 = S\ 354.192^*$
 $\$1.50 \times 354.192 = \$531.288, \text{ Ans.}$
- Ex. 3. $18.3. \times 10.73 \times 3.4 = S\ 667.6206^*$
 $\$.15 \times 667.6206 = \$100.14+, \text{ Ans.}$
- Ex. 4. $7.36 \div 3.2 = M\ 2.3 = {}_1M\ 23, \text{ Ans.}$
- Ex. 5. ${}_1M\ 5.2 \div 10 = M\ .52$; ${}_1M\ 7.3 \div 10 = M\ .73$
 $.52 \times .73 \times 13 = S\ 4.9348,^*$ volume of 1st stick
 ${}_2M\ 43 \div 100 = M\ .43$; ${}_2M\ 65 \div 100 = M\ .65$
 $.43 \times .65 \times 17.5 = S\ 4.89125$, volume of 2d stick
 ${}_1M\ 5.3 \div 10 = M\ .53$; ${}_1M\ 3.7 \div 10 = M\ .37$
 $.53 \times .37 \times 15.42 = S\ 3.023862$, volume of 3d stick
 ${}_2M\ 39 \div 100 = M\ .39$; ${}_2M\ 56 \div 100 = M\ .56$
 $.56 \times .39 \times 14 = S\ 3.0576$, volume of 4th stick
 ${}_1M\ 4.52 \div 10 = M\ .452$; ${}_1M\ 3.78 \div 10 = M\ .378$
 $.452 \times .378 \times 15 = S\ 2.56284$, volume of 5th stick
 $S\ 4.9348 + S\ 4.89125 + S\ 3.023862 + S\ 3.0576 +$
 $S\ 2.56284 = S\ 18.470352, \text{ Ans.}$
- Ex. 6. $3.2 \times 1.1 = 3.52$
 $4.0128 \div 3.52 = M\ 1.14, \text{ Ans.}$

MEASUREMENT OF ANGLES.

(Case I., page 452.)

- Ex. 1. $25^\circ 34' 42'' = 25^\circ .3442$
 $25^\circ .3442 \div 1\frac{1}{2} = 22.80978^\circ = 22^\circ 48' 35.208'', \text{ Ans.}$
 (See 370.)

* See Note under Rule, page 450, and preceding illustrations.

- Ex. 2. $57^{\circ} 98' = .5793$
 $.5793 \div 1\frac{1}{2} = .52137^{\circ} = 31^{\circ} 16.932'',$ *Ans.*
- Ex. 3. $83^{\circ} 13' 87'' = 83^{\circ}.1387$
 $83^{\circ}.1387 \div 1\frac{1}{2} = 74.82483^{\circ} = 74^{\circ} 49' 29.388'',$ *Ans.*
- Ex. 4. $36^{\circ} 98' 15'' = 36^{\circ}.9815$
 $36^{\circ}.9815 \div 1\frac{1}{2} = 33.28335^{\circ} = 33^{\circ} 17'.06'',$ *Ans.*
- Ex. 5. $14^{\circ} 15' 60'' = 14^{\circ}.1560$
 $14^{\circ}.156 \div 1\frac{1}{2} = 12.7404^{\circ} = 12^{\circ} 44' 25.44'',$ *Ans.*
- Ex. 6. $90^{\circ} 90' 90'' = 90^{\circ}.9090$
 $90^{\circ}.9090 \div 1\frac{1}{2} = 81.8181^{\circ} = 81^{\circ} 49' 5.16'',$ *Ans.*
- Ex. 7. $18^{\circ} 50' 25'' = 18^{\circ}.5025$
 $18^{\circ}.5025 \div 1\frac{1}{2} = 16.65225^{\circ} = 16^{\circ} 39' 8.1'',$ *Ans.*

(Case II., page 452.)

- Ex. 1. $36^{\circ} 18' 27'' = 36.3075^{\circ}$ (See 374)
 $36.3075 \times 1\frac{1}{2} = 40^{\circ}.3416\frac{3}{4} = 40^{\circ} 34' 16\frac{3}{4}'',$ *Ans.*
- Ex. 2. $56' 54'' = .94833\frac{1}{3}^{\circ}$
 $.94833\frac{1}{3} \times 1\frac{1}{2} = 1^{\circ}.0537\frac{1}{2} = 1^{\circ} 5' 37\frac{1}{2}'',$ *Ans.*
- Ex. 3. $27^{\circ} 36' 45'' = 27.6125^{\circ}$
 $27.6125 \times 1\frac{1}{2} = 30^{\circ}.6805\frac{5}{8} = 30^{\circ}.68' 5\frac{5}{8}'',$ *Ans.*
- Ex. 4. $189^{\circ} 15' 20'' = 189.25555\frac{5}{9}^{\circ}$ [*Ans.*]
 $189.25555\frac{5}{9} \times 1\frac{1}{2} = 210^{\circ}.2939\frac{5}{12} = 210^{\circ} 29' 39\frac{5}{12}'',$
- Ex. 5. $63^{\circ} 14' 58'' = 63.24944\frac{4}{9}^{\circ}$
 $63.24944\frac{4}{9} \times 1\frac{1}{2} = 70^{\circ}.2771\frac{4}{9} = 70^{\circ} 27' 71\frac{4}{9}'',$ *Ans.*
- Ex. 6. $147^{\circ} 24' 48'' = 147.41333\frac{1}{3}^{\circ}$ [*Ans.*]
 $147.41333\frac{1}{3} \times 1\frac{1}{2} = 163^{\circ}.7925\frac{2}{3} = 163^{\circ} 79' 25\frac{2}{3}'',$
- Ex. 7. $117^{\circ} 36' 54'' = 117.615^{\circ}$
 $117.615 \times 1\frac{1}{2} = 130^{\circ}.6833\frac{1}{2} = 130^{\circ} 68' 33\frac{1}{2}'',$ *Ans.*

TO CHANGE METRIC TO COMMON SYSTEM.

(Page 453.)

- Ex. 2. ${}_2M 472 \div 100 = M 4.72$
 $39.37 \text{ in} \times 4.72 = 185.8264 \text{ in.} = 15.4855\frac{1}{2} \text{ ft., Ans.}$
- Ex. 3. ${}^3S 2 \times 1000 = S 2000$
 $1.308 \text{ cu. yd.} \times 2000 = 2616 \text{ cu. yds.}$
 $27 \text{ cu. ft.} \times 2616 = 70632 \text{ cu. ft., Ans.}$
- Ex. 4. ${}_1L 325 \div 10 = L 32.5$ [qts., Ans.
 $1.0567 \text{ qts.} \times 32.5 = 34.34275 \text{ qts.} = 8 \text{ gal. } 2.34275$
- Ex. 5. $1.0567 \text{ qts.} \times 108.24 = 114.377208 \text{ qts.} = 28.594 +$
 gals., Ans.
- Ex. 6. ${}^3L 3262 \times 1000 = L 3262000$ [Ans.
 $.908 \text{ qts.} \times 3262000 = 2961896 \text{ qts.} = 92559.25 \text{ bush,}$
- Ex. 7. $119.6 \text{ sq. yds.} \times 436 = 52145.6 \text{ sq. yds., Ans.}$
- Ex. 8. ${}_2L 942325 \div 100 = L 9423.25$ [bush., Ans.
 $.908 \text{ qt.} \times 9423.25 = 8556.311 \text{ qts.} = 267.3847 +$
- Ex. 9. ${}^4G 436 \times 10000 = G 4360000$
 $15.432 \text{ gr.} \times 4360000 = 67283520 \text{ gr.}$
 $67283520 \text{ gr.} \div 7000 = 9611.9314 \text{ lbs., Ans.}$

TO CHANGE COMMON TO METRIC SYSTEM.

(Page 454.)

- Ex. 2. $7000 \text{ gr.} \times 6172.8 = 43209600 \text{ gr.}$ [Ans.
 $43209600 \text{ gr.} \div 15.432 \text{ gr.} = G 2800000 = {}^1G 280000,$
- Ex. 3. $2392 \text{ sq. yds.} \div 119.6 \text{ sq. yds.} = A 20 = {}^2A .2, \text{ Ans.}$
- Ex. 4. $1 \text{ sq. m.} = 3097600 \text{ sq. yds.}$ [Ans.
 $3097600 \text{ sq. yds.} \div 119.6 \text{ sq. yds.} = A 25899.665552 -$
- Ex. 5. $18924 \text{ cu. yds.} \div 1.308 \text{ cu. yds.} = S 14467.8899082$
 $S 14467.8899082 \times 1000 = {}_sS 14467889.9082, \text{ Ans.}$

- Ex. 6. $892 \text{ gr.} \div 15.432 \text{ gr.} = G 57.8019 = {}^2G .578019$, *Ans.*
- Ex. 7. $2 \text{ mi. } 6 \text{ fur. } 39 \text{ rds. } 5 \text{ yds.} = 182142 \text{ in.}$ [*Ans.*
 $182142 \text{ in.} \div 39.37 \text{ in.} = M 4626.416 = {}^3M 4.626416 +$
- Ex. 8. $\$3 \times 454 = \1362 , cost of wheat
 $454 \text{ bush.} = 14528 \text{ qts.}$
 $14528 \text{ qts.} \div .908 \text{ qt.} = L 16000 = {}^2L 160$, *Ans. to 1st*
 $\$8.75 \times 160 = \1400 , selling price of wheat
 $\$1400 - \$1362 = \$38$, Gain, *Ans.*

MISCELLANEOUS EXAMPLES.

- Ex. 1. $\$6.00 \times 122 = \732.000
 $\$.35 \times 320 = 112.000$
 $\$.30 \times 230 = 69.000$
 $\$.31 \times 206.5 = 64.015$
 $\$2.40 \times 107.9 = 258.960$
 $\$1235.975$, *Ans.*
- Ex. 2. $\$2.50 \times 30.5 \times 40 = \3050.00
 $\$40 \times 12 = 480.00$
 $\$.32 \times 110 \times 25 = 880.00$
 $\$.38 \times 95 \times 10 = 361.00$
 $\$.50 \times 12 \times 30 = 180.00$
 $\$4951.00$ *Ans.*
- Ex. 3. ${}^2M 40 \times 100 = M 4000$; ${}^2M 20 \times 100 = M 2000$
 $4000 \times 2000 = {}_2A 8000000$ *
 ${}_2A 8000000 \div 100 = A 80000$
 $A 80000 \times \frac{3}{4} = A 53333.33\frac{1}{3}$, *Ans to first*
 $119.6 \text{ sq. yds.} \times 80000 = 9568000 \text{ sq. yds.} =$
 1976.8595 acres
 $\$100 \times 1976.8595 = \197685.95 , *Ans.*

* See Note under Rule, page 447, and preceding illustrations.

- Ex. 4. $\$6.00 \times 540 = \3240.00 , received for wheat
 $\$3240 \div \$8 = 405$, tons coal purchased
 $405 \times 2000 \times 7000 = 5670000000$ gr.
 5670000000 gr. $\div 15.432$ gr. = $^{\circ}\text{G } 367488351.47$
 $\text{G } 367418351.47 \div 10000 = ^{\circ}\text{G } 36741.835147$, *Ans.*
- Ex. 5. $42.5 \times 2 \times 1.9 = \text{S } 161.5^*$
 $\$2 \times 161.5 = \323 , *Ans.*
- Ex. 6. $\$1.20 \times 300 = \360 , received for oats
 $\$360 \div \$.25 = \text{M } 1440$, *Ans.*
- Ex. 7. $\$.28 \div 7000 = \$.00004$, cost of 1 grain butter $^{\circ}\text{G}$
 $\$.00004 \times 15432$ (No grain in $^{\circ}\text{G}$) = $\$.61728$, cost of
 $\$.61728 - \$.60 = \$.01728$, loss on $^{\circ}\text{G}$
 $\$.01728 \div \$.61728 = .028143 = 2\frac{1}{4}\frac{1}{3}\%$ lost, *Ans.*
- Ex. 8. $5 \times 5 \times 2.5 = \text{S } 62.5$ [Ans. to first
Since $\text{S} = ^{\circ}\text{L}$, $\text{S } 62.5 = ^{\circ}\text{L } 62.5 = \text{L } 62500 = ^{\circ}\text{L } 625$
 $.908$ qt. $\times 62500 = 56750$ qts. = 1773.4375 bush.
 $\$2 \times 1773.4375 = \3546.875 , *Ans.*
- Ex. 9. 15.432 gr. $\times 100 = 1543.2$ gr., No grains in $^{\circ}\text{G}$
 $\$2.50 \div 1543.2 = \$_{1543.2}^{2.5}$, cost of one grain
 $\$_{1543.2}^{2.5} \times 7000 = \11.34 , *Ans.*
- Ex. 10. $\$2.00 \times 240 = \480 , cost of silk
 39.37 in. $\times 240 = 9448.8$ in. = $262.4\frac{2}{3}$ yds.
 $\$1.95 \times 262.4\frac{2}{3} = \511.81 , received for silk
 $\$511.81 - \$480 = \$31.81$ gain, *Ans.*
- Ex. 11. $1^{\circ} 5'' = \$.0105$ $\$.0105 \div 1\frac{1}{2} = .00945^{\circ}$, *Ans.*
- Ex. 12. 250 lbs. $\times 50 = 12500$ lbs. = 125 cwt.
 $12500 \times 7000 = 87500000$ grs.
 87500000 grs. $\div 15432$ gr. = $^{\circ}\text{G } 5670.036$
 $\$.34 \times 5670.036 = \1927.812 , received for sugar
 $\$2 \times 125 = \250 , cost of transportation
 $\$1927.812 - \$250 = \$1677.812$, to be invested in cloth
 $\$1677.812 \div \$4 = \text{M } 419.453$ [yds., *Ans.*
 39.37 in. $\times 419.453 = 16513.86461$ in. = $458.71+$

* See Note under Rule, page 450, and preceding illustrations.

Ex. 13. $10^{\circ} \div 1\frac{1}{2} = 9^{\circ}$; $(45^{\circ} + 9^{\circ}) \div 2 = 27^{\circ}$, greater angle
 $(45^{\circ} - 9^{\circ}) \div 2 = 18^{\circ}$, lesser angle

Ex. 14. $66\frac{2}{3} \div 1\frac{1}{2} = 60^{\circ}$; and, since 20 units of angular measure
 are equal to 60° , one unit is equal to $\frac{1}{20}$ of $60^{\circ} =$
 3° , *Ans.*

Ex. 15. When the unit of length is a Metre, the unit of surface
 is a Centiare (see Note to Rule, page 447, and pre-
 ceding illustrations); therefore,

(M 6.2 + M 4.7) \times 2 = M 21.8, around first room

21.8 \times 3.8 = $\frac{1}{2}$ A 82.84, in walls of first room

6.2 \times 4.7 = $\frac{1}{2}$ A 29.14, " ceiling " "

(M 4.52 + M 4) \times 2 = M 17.4, around second room

17.4 \times 3.8 = $\frac{1}{2}$ A 64.752, in walls " "

4.52 \times 4 = $\frac{1}{2}$ A 18.08 " ceiling " "

(M 6 + M 5.2) \times 2 = M 22.4, around third room

22.4 \times 3.8 = $\frac{1}{2}$ A 85.12, in walls " "

5.2 \times 6 = $\frac{1}{2}$ A 31.2, " ceiling " "

(M 3.82 + M 3.82) \times 2 = M 15.28, around fourth room

15.28 \times 3.8 = $\frac{1}{2}$ A 58.064, in walls " "

3.8 \times 3.8 = $\frac{1}{2}$ A 14.5924 " ceiling " "

(M 6.2 + M 7) \times 2 = M 26.4, around fifth room

26.4 \times 3.8 = $\frac{1}{2}$ A 100.32, in walls " "

6.2 \times 7 = $\frac{1}{2}$ A 43.4 " ceiling " "

(M 4.5 + M 4.25) \times 2 = M 17.5, around sixth room

17.5 \times 3.8 = $\frac{1}{2}$ A 66.5, in walls " "

4.25 \times 4.5 = $\frac{1}{2}$ A 19.125, in ceiling " "

$\frac{1}{2}$ A 82.84 + $\frac{1}{2}$ A 29.14 + $\frac{1}{2}$ A 64.752 + $\frac{1}{2}$ A 18.18 + $\frac{1}{2}$ A 85

.12 + $\frac{1}{2}$ A 31.2 + $\frac{1}{2}$ A 58.64 + $\frac{1}{2}$ A 14.5924 + $\frac{1}{2}$ A 100

.32 + $\frac{1}{2}$ A 43.4 + $\frac{1}{2}$ A 66.5 + $\frac{1}{2}$ A 19.125 = $\frac{1}{2}$ A 613

.1334, area of walls and ceilings

$\frac{1}{2}$ A 613.1334 \div 12 = $\frac{1}{2}$ A 51.09445 [first

$\frac{1}{2}$ A 613.1334 - $\frac{1}{2}$ A 51.09445 = $\frac{1}{2}$ A 562.03895, *Ans.* to

$\$.38 \times 562.03895 = 213.57 +$, *Ans.*



K E Y

TO THE

MISCELLANEOUS EXAMPLES

IN THE

PROGRESSIVE INTELLECTUAL ARITHMETIC.

97.

2. Since he sold $\frac{2}{3}$ of his share, he had $\frac{1}{3}$ left; and $\frac{1}{3}$ of $\frac{2}{3}$ is $\frac{2}{9}$. Therefore, if a man owning $\frac{2}{3}$ of a share in the Central Railroad sold $\frac{2}{3}$ of it, he had $\frac{1}{3}$ of a share left.

3. Since he gave $\frac{1}{3}$ of it away, he had $\frac{2}{3}$ of it left; and $\frac{2}{3}$ of $\frac{1}{3}$ is $\frac{2}{9}$. Therefore, etc.

4. Since he gave $\frac{2}{3}$ of it for a knife, he has $\frac{1}{3}$ of it left, and $\frac{2}{3}$ of $\frac{1}{3}$ is $\frac{2}{9}$. Therefore, etc.

5. Since \$18 was $\frac{2}{3}$ of what the watch cost, he lost $\frac{1}{3}$ of the cost, which is $\frac{1}{3}$ of \$18 or 6. Therefore, etc.

6. Since \$45 was $\frac{2}{3}$ of the cost, he gained $\frac{1}{3}$, which is $\frac{1}{3}$ of \$45, or \$15. Therefore, etc.

7. Since $\frac{2}{3}$ of the cost was sacrificed, \$120 is $\frac{1}{3}$ of the cost; $\frac{1}{3}$ of \$120, which is \$40, is $\frac{1}{3}$, and 3 times \$40 is \$120, the whole loss. Therefore, etc.

8. Since he lent $\frac{1}{3}$ of the remainder, \$22 is $\frac{2}{3}$, and $\frac{1}{3}$ of \$22, which is \$7.33, is $\frac{1}{3}$; 3 times \$7.33 is \$22, or the whole of the remainder; and \$22 is $\frac{1}{3}$ of 4 times \$22 which is \$88. Therefore, etc.

9. Since \$80 was $\frac{1}{3}$ of $\frac{2}{3}$ of 2 times, or $\frac{2}{3}$ the cost, the loss was $\frac{1}{3}$, which is $\frac{1}{3}$ of \$80, or \$26.67. Therefore, etc.

10. Since \$54 was $\frac{2}{3}$ of 2 times, or $\frac{4}{3}$ the selling price, he gained $\frac{1}{3}$, which is $\frac{1}{3}$ of \$54, or \$9. Therefore, etc.

11. Since 15 is $\frac{5}{3}$, $\frac{1}{3}$ of 15, which is 3, is $\frac{1}{3}$; 8 times 3 is 24, and $\frac{1}{3}$ of 24 is 8. Therefore, etc. Or, $\frac{1}{3}$ of that number of which $\frac{1}{3}$ of 15 is $\frac{1}{3}$.

12. Since 4 is $\frac{2}{3}$, $\frac{1}{3}$ of 4, which is 2, is $\frac{1}{3}$; 3 times 2 is 6, which is $\frac{1}{2}$ of 2 times 6, or 12. 4 from 12 leaves 8, and 2 times 8 is 16. Therefore, etc.

13. Since he sold $\frac{2}{3}$ of his flock, 20 must be $\frac{2}{3}$; $\frac{1}{3}$ of 20, which is 10, is $\frac{1}{3}$, and 5 times 10 is 50. Therefore, etc.

14. Since $\frac{2}{3}$ of the remainder, or $\frac{2}{3}$ of $\frac{2}{3}$ which is $\frac{4}{9}$, was in the water, the 3 feet in the mud must be the remaining $\frac{5}{9}$; and 3 feet is $\frac{1}{3}$ of 5 times 3 or 15 feet. Therefore, etc.

15. $\frac{1}{3} + \frac{2}{3} = \frac{3}{3}$, and the 4 years equals the remaining $\frac{2}{3}$, and 4 years are $\frac{2}{3}$ of 30 years. Therefore, etc.

16. Since \$20 = $\frac{2}{3}$ the cost of the coat plus \$12, \$20 - \$12 = \$8, or $\frac{2}{3}$ the cost; $\frac{1}{3}$ of \$8, or \$4 = $\frac{1}{3}$, and 3 times \$4 is \$12. Therefore, etc.

17. If $\frac{1}{2}$ the number + 80 was 5 more than 3 times the number, 80 - 5 = 75, when added to $\frac{1}{2}$ the number must have been 3 times the number. $3 = \frac{3}{2}$, and $\frac{3}{2} - \frac{1}{2} = \frac{2}{2}$; and 75 must have been $\frac{2}{2}$ times the number. 75 is $\frac{5}{2}$ of 2 times $\frac{1}{2}$ of 75, or 30. Therefore, etc.

18. Since 16 is $\frac{2}{3}$, $\frac{1}{3}$ of 16 or 8 is $\frac{1}{3}$, and 3 times 8 is 24, which is twice as many as James has; then $\frac{1}{2}$ of 24 or 12 is what James has after losing 16, and 12 + 16 = 28, or the number James had at first; since $\frac{2}{3}$ of John's equaled $\frac{2}{3}$ of James's, $\frac{1}{3}$ of $\frac{2}{3}$ or $\frac{1}{3}$ of James's = $\frac{1}{3}$ of John's; $\frac{1}{3}$ of 28 is 4, and 5 times 4 is 20, or what John had at first. Therefore, etc.

19. Since $\frac{2}{3} + 10$ years = $1\frac{1}{3}$ or $\frac{4}{3}$ of his age, $\frac{4}{3} - \frac{2}{3} = \frac{2}{3}$ or $\frac{1}{3}$ must = 10 years; and 2 times 10 years is 20 years. Therefore, etc.

20. Since $\frac{2}{3}$ of \$40 is $\frac{2}{3} \times 40 = \frac{80}{3}$, $\frac{1}{3}$ of $\frac{2}{3}$, or $\frac{1}{3}$ of \$40 is $\frac{40}{3}$; $\frac{1}{3}$ of \$40 is \$8, and 11 times \$8 is \$88, which is $2\frac{2}{3}$ or $\frac{8}{3}$ times $\frac{1}{3}$; $\frac{1}{3}$ of

\$88 or \$11 is $\frac{1}{3}$ of 3 times \$11 or \$33, and \$33 is $\frac{1}{4}$ of 4 times \$33, or \$132. Therefore, etc.

21. $\frac{4}{5}$ times $\frac{7}{8}$ is $\frac{7}{10}$; and 25 is $\frac{4}{5}$ of 4 times $\frac{1}{4}$ of 25 which is 20. Therefore, etc.

22. Since he made away with $\frac{3}{4}$ of $\frac{4}{5}$ of it, the \$10 left was the remaining $\frac{1}{4}$ of $\frac{4}{5}$ or $\frac{1}{5}$ of the whole; and 5 times \$10 is \$50. Therefore, etc.

23. Since $\frac{2}{3}$ of \$1500 is $\frac{2}{3}$, $\frac{1}{3}$ of $\frac{2}{3}$, or $\frac{2}{9}$ of \$1500, which is \$200, is $\frac{1}{8}$; 8 times \$200 is \$1600, which is 4 times the cost of the barn, and $\frac{1}{4}$ of \$1600 is \$400. Therefore, etc.

24. Since $\frac{3}{4}$ of 500 or 300 men was $\frac{3}{4}$ of $\frac{4}{5}$, or $\frac{3}{5}$ of the force, 50 times 300 men or 15000 men, was the whole force. Therefore, etc.

25. Since $\frac{3}{4}$ of 100 or 60 was $7\frac{1}{2}$ or $\frac{15}{2}$, $\frac{1}{5}$ of 60 which is 4 is $\frac{1}{2}$; 2 times 4 is 8, which is $\frac{1}{8}$ of 100 times 8 or 800. Therefore, etc.

26. Since $\frac{5}{6}$ of 60 or 50 was $2\frac{1}{2}$ or $\frac{5}{2}$ times $\frac{1}{5}$, $\frac{1}{3}$ of 50 or 10 men is $\frac{1}{3}$, and 2 times 10 is 20, which is $\frac{1}{15}$ of 150 times 20 or 3000 men. Therefore, etc.

27. Since $\frac{4}{5}$ of 100 or 80 was $1\frac{2}{5}$ or $\frac{7}{5}$, $\frac{1}{5}$ of 80 or 8 is $\frac{1}{5}$. 7 times 8 is 56, less 6=50 or $\frac{1}{20}$. And 20 times 50 is 1000. Therefore, etc.

28. Since $2\frac{1}{3}$ times 30 or 70 is $3\frac{1}{3}$ or $\frac{10}{3}$, $\frac{1}{10}$ of 70 or 7 is $\frac{1}{3}$, 3 times 7 is 21, which is $\frac{1}{10}$ of 10 times 21 or 210. Therefore, etc.

29. Since $\frac{5}{6}$ of 1200 or 1000 is $8\frac{1}{3}$ or $\frac{25}{3}$, $\frac{1}{25}$ of 1000 or 40 is $\frac{1}{5}$; 3 times 40 is 120, which is $\frac{1}{10}$ and $\frac{1}{5}$ of 120 or 20 is $\frac{1}{10}$; 100 times 20 or 2000 is $\frac{1}{5}$ of 10000, which lacking 1000 of being the whole army, $10000 + 1000 = 11000$. Therefore, etc.

98.

2. Since $\$6 + \4 or $\$10$, bought 40 bushels, $\$1$ would buy $\frac{1}{10}$ of 40 bushels or 4 bushels, and $\$6$ would buy 6 times 4 bushels or 24 bushels, and $\$4$, 4 times 4 bushels or 16 bushels. Therefore, etc.

3. Since they approach each other 4 miles + 3 miles or 7 miles an hour, they will meet in $\frac{1}{7}$ or 7 hours, and the one who traveled 4 miles per hour would travel 7 times 4 or 28 miles, and he who traveled 3, 7 times 3 or 21 miles. Therefore, etc.

4. Since 3 weeks + 2 weeks or 5 weeks' hire is $\$25$, 1 week is $\frac{1}{5}$ of $\$25$ or $\$5$, 2 weeks 2 times $\$5$ or $\$10$, and 3 weeks 3 times $\$5$ or $\$15$. Therefore, etc.

5. Since 5 cows + 3 cows or 8 cows' pasture cost $\$24$, 1 cow's pasture cost $\frac{1}{8}$ of $\$24$, or $\$3$, 5 cows' 5 times $\$3$ or $\$15$, and 3 cows' 3 times $\$3$ or $\$9$. Therefore, etc.

6. 2 horses for 2 weeks = 1 horse 4 weeks, and 2 horses 4 weeks = 1 horse 8 weeks; and since 12 weeks' pasture cost $\$12$, 1 week's pasture costs $\frac{1}{12}$ of $\$12$, or $\$1$, 4 weeks' 4 times $\$1$ or $\$4$, and 8 weeks' 8 times $\$1$ or $\$8$. Therefore, etc.

7. Since 9 cents + 7 cents or 16 cents bought 32 figs, 1 cent would buy $\frac{1}{16}$ of 32 or 2 figs, 9 cents would buy 9 times 2 or 18 figs, and 7 cents would buy 7 times 2 or 14 figs. Therefore, etc.

8. A's $\$10$ for 5 months = $\$5$ for 1 month, B's $\$5$ for 8 months = $\$40$ for 1 month; and since $\$50 + \40 or $\$90$ gain $\$45$, $\$1$ will gain $\frac{1}{90}$ of $\$45$, or $\$1$, $\$50$ 50 times $\$1$, or $\$25$, and $\$40$, 40 times $\$1$, or $\$20$. Therefore, etc.

9. Since they paid in the proportion of $\$5$, $\$4$, and $\$3$, they own in the same proportion; consequently the gain is divided into 5 plus 4 plus 3, or 12 parts, and $\frac{1}{12}$ of $\$24$ is $\$2$. A's portion is 5 times $\$2$ or $\$10$; B's, 4 times $\$2$ or $\$8$; and C's, 3 times $\$2$ or $\$6$. Therefore, etc.

10. Since A does 2 times 3 days, or 6 days' work, B 3 times 3 days, or 9 days' work, and C 3 times $2\frac{1}{2}$ or 5 days'

work, it takes 20 days to mow the field; 1 day's work costs $\frac{1}{20}$ of \$40, or \$2; and A should receive 6 times \$2, or \$12; B 9 times \$2, or 18; and C 5 times \$2, or \$10. Therefore, etc.

11. Since C took \$10, or $\frac{1}{2}$ of the gain, he must have put in $\frac{1}{2}$ of the stock, and A's \$30 plus B's \$50, or \$80 = $\frac{1}{2}$ of \$160, or \$80, or \$5 = $\frac{1}{2}$ of \$10, and 5 times \$5 or \$25 = C's stock. \$42 - \$10 = \$32, A's + B's gain; A's = $\frac{2}{3}$ of \$32, or \$12; and B's = $\frac{1}{3}$ of \$32, or \$20. Therefore, etc.

12. Since he put in $\frac{2}{3}$ of the capital, he should also take $\frac{2}{3}$ of the gain; $\frac{2}{3}$ of \$240 = \$160, and \$160 - \$145 = \$15 loss. Therefore, etc.

13. Since 2 colts consume as much as 3 calves, 4 colts, or 2 times 2 colts = 2 times 3 calves, or 6 calves, and 5 calves plus 6 calves = 11 calves. If 11 calves cost \$11, 1 calf cost $\frac{1}{11}$ of \$11, or \$1; 5 calves 5 times \$1, or \$5; and 6 calves 6 times \$1, or \$6. Therefore, etc.

14. Since C pays $\frac{1}{3}$ of the rent, he puts in $\frac{1}{3}$ of the cows. Then A's 5 cows + B's 3 cows = 8 cows = $\frac{2}{3}$ of the cows, and $\frac{1}{2}$ of 8, or 4 cows = C's number. And since C's 4 cows cost $\frac{1}{4}$ of \$42 or \$14, 1 cow cost $\frac{1}{4}$ of \$14, or \$3 $\frac{1}{2}$; 5 cows cost 5 times \$3 $\frac{1}{2}$, or \$17 $\frac{1}{2}$; and 3 cows 3 times \$3 $\frac{1}{2}$, or \$10 $\frac{1}{2}$. Therefore, etc.

15. Since 4 cows = 3 oxen, 8 cows, being twice 4, = 2 \times 3, or 6 oxen; and since 5 calves = 4 cows, 10 calves, being twice 5, = 2 \times 4 or 8 cows. But 8 cows = 6 oxen; and 9 oxen + 6 oxen = 21 oxen, which cost \$56. 1 ox cost $\frac{1}{21}$ of \$56 or \$2 $\frac{2}{3}$; 9 oxen 9 times \$2 $\frac{2}{3}$, or \$24; and 6 oxen 6 times \$2 $\frac{2}{3}$, or 16; etc.

16. Since Mary wrote $\frac{7}{8}$ as many lines as Melissa, Melissa's work is divided into 8 parts, 7 of which = Mary's; then 8 + 7 = 15; and $\frac{1}{15}$ of 60 is 4; $\frac{7}{15}$ 8 times 4, or 28 and $\frac{1}{15}$ 7 times 4, or 28. Therefore, etc.

17. Since the boys received as many pears as the girls, they received $\frac{1}{2}$ of 24, or 12. There were as many boys as

3 is contained times in 12, which is 4 times; as many girls as 4 is contained times in 12, which is 3 times; and $4 + 3 = 7$. Therefore, etc.

18. Since each son received $\frac{1}{2}$ as much as each daughter, the 2 sons received as much as 1 daughter; then we have \$96 divided into $3 + 1 = 4$ parts; $\frac{1}{4}$ of \$96 = \$24 = each daughter's portion; and $\frac{1}{2}$ of \$24 = \$12 = each son's portion. Therefore, etc.

99.

1 The 1st has 1 part, the 2d 1 part + 2, and the 3d 1 part + 2 + 6; then 3 parts + 2 + 2 + 6 = 76, or $76 = 3$ parts + 10; and $76 - 10$, or $66 = 3$ parts; $\frac{1}{3}$ of 66 or 22 = what 1st boy had; $22 + 2$, or 24 = what 2d boy had; and $22 + 2 + 6$, or 30 = what 3d boy had. Therefore, etc.

2. Henry has 2 more than James, and Joseph having 2 more than Henry, has 4 more than James; hence 72, the sum of all, is $2 + 4$, or 6 more than if each had no more than James. $72 - 6 = 66$, *Ans.*

3. If Henry had 2 more he would have as many as Joseph; and $\text{James} + 2 = \text{Henry}$, and $+ 2$ more = Joseph; and $72 + 2 + 2 + 2 = 78$, *Ans.*

4. If Joseph give James 2, Joseph's number will be diminished and James's increased 2, when each will = Henry's. James will now have $\frac{1}{3}$ of $72 - 6$, or 22; Henry $22 + 2$, or 24; and Joseph $24 + 2$, or 26. Therefore, etc.

5. Since C paid as much as A and B, he paid $\frac{1}{2}$ of \$600, or \$300; and B and A paid \$300. And as B paid \$100 more than A, $\$300 - \$100 = \$200$, or what each would have paid if they had paid no more than A. $\frac{1}{2}$ of \$200 is \$100, or what A paid; and $\$100 + \$100 = \$200$, what B paid.

6. The drum cost 1 part, the rifle twice as much, or 2 parts, and the watch twice as much as the rifle, or 4 parts; hence \$42 is divided into 1 part + 2 parts + 4 parts, or 7 parts. $\frac{1}{7}$ of \$42, or \$6 = cost of drum; 2 times \$6, or \$12 = cost of rifle; and 2 times \$12, or \$24 = cost of watch. Therefore, etc.

7. The harness cost 2 parts, the horses 4 times as much or 8 parts, and the wagon $1\frac{1}{2}$ times the harness, or 3 parts; and the harness 2 parts + the horses 8 parts, plus the wagon 5 parts = 15 parts = \$225. $\frac{1}{15}$ of \$225 is \$15, and 2 times \$15, or \$30 = harness; 8 times \$15, or \$120 = cost of horses; and 5 times \$15, or \$75 = cost of wagon, etc.

8. Since he traveled $\frac{1}{3}$ as far the 1st as the last 2 days, the last 2 days' travel is divided into 2 parts of which 1 = first day; hence $\frac{1}{3}$ of 114 miles, or 38 miles = 1st day; the same reasoning applied to the last day gives 38 miles, and leaves 38 miles for the 2d day.

10. The note of \$20 was less than $\frac{1}{2}$ of what remained due after the 1st payment, by the \$20 *that exceeded* $\frac{1}{2}$; hence \$20 + \$20, or \$40 = $\frac{1}{2}$. 2 times \$40, or \$80 = what remained after 1st payment, and \$80 was less than $\frac{1}{2}$ the debt, by the \$10 the payment exceeded $\frac{1}{2}$; \$80 + \$10, or \$90 = $\frac{1}{2}$; and 2 times \$90, or \$180 = the whole debt.

11. The 4 pennies left is less than $\frac{1}{2}$ of the remainder by the 1 penny more than $\frac{1}{2}$ paid for the whip; then $4 + 1 = 5$ pennies, or $\frac{1}{2}$, and 2 times 5, or 10 pennies = remainder after purchasing top; and since he paid 2 pennies more than $\frac{1}{2}$ of all for the top, 10 pennies + 2 pennies, or 12 pennies = $\frac{2}{3}$; $\frac{1}{3}$ of 12 or 6 pennies = $\frac{1}{3}$; and 3 times 6 = 18 pennies. Therefore, etc.

12. Since he sold the whole, the $\frac{1}{2}$ gallon *more* than $\frac{1}{2}$ the remainder sold was $\frac{1}{2}$ of the remainder, and 2 times $\frac{1}{2}$ or 1 gallon = remainder. The gallon left after 1st sale was less than $\frac{1}{2}$ the keg by the $\frac{1}{2}$ gallon more than the $\frac{1}{2}$ gallon sold; then 1 gallon + $\frac{1}{2}$ gallon or $1\frac{1}{2}$ gallons = $\frac{1}{2}$ the keg, and 2 times $1\frac{1}{2}$ or 3 gallons = the contents of the keg.

14. Since $\frac{3}{4}$ of John's = $\frac{1}{4}$ of Mary's, $\frac{1}{3}$ of John's = $\frac{1}{2}$ of $\frac{3}{4}$ or $\frac{1}{2}$ of Mary's, and $\frac{3}{4}$ or all of John's = 3 times $\frac{1}{2}$ or $\frac{3}{2}$ of Mary's; hence Mary's are divided into 8ths and John's = 9 of them, and the whole = $\frac{17}{8}$ of Mary's. $\frac{1}{17}$ of 34 or 2 is $\frac{1}{8}$; 9 times 2 or 18 = John's, and 8 times 2 = 16 = Mary's.

15. Since $\frac{2}{3}$ of A's plus 8=B's, B's-8= $\frac{2}{3}$ of A's; and if 8 be taken from B's, the sum of both flocks will be 83-8 or 75. A has 3 parts, B 2, and both 5. $\frac{1}{5}$ of 75 is 15. 3 times 15 or 45=A's; and 2 times 15 or 30, +8=38, B's.

16. Since $\frac{3}{4}$ of Mary's less 10 cents=Susan's, Susan's+10 cents= $\frac{3}{4}$ of Mary's, and then both would have 39+10 or 49 cents. Mary having 4 parts, and Susan 3, they both have 7 parts. $\frac{1}{7}$ of 49 or 7=1 part; 4 times 7 or 28=Mary's; and 3 times 7 or 21-10=11=Susan's.

17. Since $\frac{2}{3}$ of Homer's= $\frac{4}{5}$ of Silas's, $\frac{1}{3}$ of Homer's will= $\frac{2}{5}$ of $\frac{4}{5}$ or $\frac{4}{5}$ of Silas's, and $\frac{1}{3}$ or the whole of Homer's, 5 times $\frac{4}{5}$ or $4\frac{4}{5}$ of Silas's; and since Homer's exceeds Silas's by $\frac{1}{5}$ of Silas's, the 3 marbles must= $\frac{1}{5}$ of Silas's; hence Silas has 7 marbles and Homer 10.

100.

1. Since the first drink a gallon in 3 days, he will drink $\frac{1}{3}$ of a gallon in 1 day, and since the second drink a gallon in 4 days, he will drink $\frac{1}{4}$ of a gallon in 1 day; both will drink $\frac{1}{3}+\frac{1}{4}$ or $\frac{7}{12}$ of a gallon in 1 day, and 1 gallon will last as many days as $\frac{12}{7}$, what they drink in 1 day, is contained times in $1\frac{5}{7}$ or 1 gallon; $\frac{12}{7}$ is in $1\frac{5}{7}$ $1\frac{5}{7}$ times. Therefore, etc.

2. Since Julia can do it in 7 hours, in 4 hours she can do $\frac{4}{7}$ of it, and Jane must do the remaining $\frac{3}{7}$; and since Jane does $\frac{3}{7}$ in 4 hours, she will do $\frac{1}{7}$ in $\frac{1}{3}$ of 4 or $1\frac{1}{3}$ hours, and $\frac{4}{7}$, or the whole, in 7 times $1\frac{1}{3}$, or $9\frac{1}{3}$ hours. Therefore, etc.

3. Since the first can do it in 9 hours, he can do $\frac{5}{9}$ in 5 hours, and the second must do the remaining $\frac{4}{9}$; and since the second pitches $\frac{4}{9}$ in 5 hours, he can pitch $\frac{1}{9}$ in $\frac{1}{4}$ of 5, or $1\frac{1}{4}$ hours, and $\frac{5}{9}$, or the whole, in 9 times $1\frac{1}{4}$, or $11\frac{1}{4}$ hours.

4. $3\frac{2}{3}=2\frac{2}{3}$ and $7\frac{1}{4}=5\frac{3}{4}$. Since the second pipe can empty it in $2\frac{2}{3}$ hours, it can empty $\frac{1}{3}$ of it in $\frac{1}{3}$, and $\frac{2}{3}$ in $2\frac{2}{3}$ hours, and the first must empty the remaining $\frac{2}{3}$; and since the first can empty $\frac{2}{3}$ in $2\frac{2}{3}$ hours, it can empty $\frac{1}{3}$ in $\frac{1}{2}$ of $2\frac{2}{3}$, or $1\frac{1}{3}$ hour, and $\frac{2}{3}$, or the whole, in 58 times $\frac{1}{3}$, or $7\frac{1}{3}$ hours.

5. Since A can make a vest in $\frac{3}{4}$ of a day, he can make as many vests in a day as $\frac{3}{4}$ is contained times in $\frac{4}{4}$, or $1\frac{1}{3}$ vests; B as many as $\frac{3}{4}$ is contained times in $\frac{4}{4}$, or $1\frac{1}{3}$ vests; and $1\frac{1}{3} + 1\frac{1}{3}$, or 3 vests = what A and B can both do. C can make as many as $\frac{3}{4}$ is contained times in $\frac{4}{4}$, or $1\frac{1}{3}$ vests, and $3 - 1\frac{1}{3} = 1\frac{2}{3}$. Therefore, etc.

6. Susan can knit as many pairs as $\frac{3}{4}$ is contained times in $\frac{4}{4}$, or $1\frac{1}{3}$ pairs; Sarah can knit as many as $\frac{3}{4}$ is contained times in $\frac{4}{4}$, or $2\frac{1}{3}$ pairs; and $1\frac{1}{3} + 2\frac{1}{3} = 4$ pairs.

7. Since Sarah can knit $2\frac{1}{3}$ or $\frac{7}{3}$ pairs in a day, she can knit $\frac{1}{3}$ of a pair in $\frac{1}{7}$ of a day, which is the part she must knit for Susan.

8. Since Susan can knit $1\frac{1}{3}$ or $\frac{4}{3}$ pairs in a day, she can knit $\frac{1}{3}$ of a pair in $\frac{1}{4}$ of a day, which is the part she must knit for Sarah.

9. Since Jason can hoe 10 rows in $\frac{3}{4}$ of an hour, he can hoe 1 row in $\frac{1}{10}$ of $\frac{3}{4}$, or $\frac{3}{40}$ of an hour, and as many rows in an hour as 3 is contained times in 40 or $13\frac{1}{3}$ rows. Since Jesse can hoe 10 rows in $\frac{3}{5}$ of an hour, he can hoe 1 row in $\frac{1}{10}$ of $\frac{3}{5}$ or $\frac{3}{50}$ of an hour, and as many rows in an hour as 3 is contained times in 50, or $16\frac{2}{3}$ rows; and both can hoe $13\frac{1}{3} + 16\frac{2}{3}$, or 30 rows, in an hour; 1 row in $\frac{1}{30}$ of an hour; and 10 rows in $\frac{1}{3}$ or $\frac{1}{3}$ of an hour.

10. Since Jesse can hoe $16\frac{2}{3}$ or $\frac{50}{3}$ rows in an hour, in $\frac{1}{3}$ of an hour he can hoe $\frac{1}{3}$ of $\frac{50}{3}$ or $\frac{50}{9} = 5\frac{5}{9}$ rows; leaving $1\frac{1}{3}$ rows for Jason, who can hoe $13\frac{1}{3}$ or $\frac{40}{3}$ rows in an hour, $\frac{1}{3}$ of a row in $\frac{1}{40}$ of an hour, and $1\frac{1}{3}$ or $\frac{4}{3}$ rows in 5 times $\frac{1}{40}$ or $\frac{1}{10}$ of an hour.

11. Since Jason can hoe $13\frac{1}{3}$ or $\frac{40}{3}$ rows in an hour, in $\frac{1}{3}$ of an hour he can hoe $\frac{1}{3}$ of $\frac{40}{3}$, or $\frac{40}{9} = 4\frac{4}{9}$ rows; leaving $5\frac{5}{9}$ rows for Jesse, who can hoe $16\frac{2}{3}$, or $\frac{50}{3} = 16\frac{2}{3}$ rows in an hour, $\frac{1}{3}$ of a row in $\frac{1}{50}$ of an hour, and $5\frac{5}{9}$, or $5\frac{5}{9}$ rows in 50 times $\frac{1}{50}$, of an hour.

12. See analysis of Example 9.

13. Since A and B can clear the field in 15 days, they can
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clear $\frac{1}{5}$ of it in 1 day, and $\frac{2}{5}$ or $\frac{2}{3}$ of it in 9 days; and since A and B clear $\frac{2}{3}$ of it in 9 days, C must clear the remaining $\frac{1}{3}$; and if he clear $\frac{1}{3}$ in 9 days, he will clear $\frac{1}{5}$ in $\frac{1}{2}$ of 9 or $4\frac{1}{2}$ days, and $\frac{2}{3}$ or the whole field in 5 times $4\frac{1}{2}$ or $22\frac{1}{2}$ days.

14. Since A and B can dig it in 6 days, they can dig $\frac{1}{6}$ of it in 1 day; since A and C can dig it in 8 days, they can dig $\frac{1}{8}$ of it in 1 day; and $\frac{1}{6} - \frac{1}{8}$ or $\frac{1}{24}$ of it, is what B does more in a day than C. As B and C dig it in 9 days, they can dig $\frac{1}{9}$ of it in 1 day, and since B's day's work exceeds C's by $\frac{1}{24}$ of the well, $\frac{1}{9} - \frac{1}{24}$ or $\frac{1}{72} = 2$ of C's days, and $\frac{1}{2}$ of $\frac{1}{72}$ or $\frac{1}{144} =$ what C can do in 1 day; hence C can do it in as many days as 5 is contained times in 144 or $28\frac{1}{2}$ days. Since B and C dig $\frac{1}{9}$ of it in 1 day, and C digs $\frac{1}{144}$ of it in 1 day, $\frac{1}{9} - \frac{1}{144}$ or $\frac{15}{144} =$ what B digs; hence B can dig it in as many days as 11 is contained times in 144 or $13\frac{1}{11}$ days. Since A and B dig $\frac{1}{6}$ of it in 1 day, and B digs $\frac{15}{144}$ of it in 1 day, $\frac{1}{6} - \frac{15}{144}$ or $\frac{1}{48} =$ what A digs in 1 day; hence A can dig it in as many days as 13 is contained times in 144 or $11\frac{1}{13}$ days.

15. Since A digs $\frac{1}{144}$, B $\frac{1}{144}$, and C $\frac{1}{144}$ of it in 1 day they will all dig $\frac{1}{144} + \frac{1}{144} + \frac{1}{144}$, or $\frac{3}{144}$ of it in 1 day; and it will take as many days as 29 is contained times in 144 or $42\frac{8}{9}$ days.

16. Since Patrick and Peter can dig it in 15 days, they can dig $\frac{1}{15}$ of it in 1 day, and $\frac{1}{5}$ or $\frac{2}{3}$ in 10 days, and Philo must dig the remaining third; and since Philo digs $\frac{1}{3}$ in 10 days, he can dig $\frac{2}{3}$ or the whole in 3 times 10 or 30 days. Since Philo can dig it in 30 or $\frac{2}{3}$ days, he can dig $\frac{1}{60}$ of it in $\frac{1}{3}$ of a day, and in $13\frac{1}{3}$ or $\frac{40}{3}$ days he can dig 40 times $\frac{1}{60}$ or $\frac{2}{3}$ of it, and Peter must dig the remaining $\frac{1}{3}$; and since he digs $\frac{1}{3}$ in $\frac{40}{3}$ days, he will dig $\frac{1}{6}$ in $\frac{1}{3}$ of $\frac{40}{3}$ or $\frac{10}{3}$ days, and $\frac{2}{3}$ or the whole in 9 times $\frac{10}{3}$ or 24 days. Since Peter can dig it in 24 days, in 15 days he can dig $\frac{5}{8}$ or $\frac{5}{8}$ of it, and Patrick must dig the remaining $\frac{3}{8}$; and since he digs $\frac{3}{8}$ in 15 days, he will dig $\frac{1}{8}$ in $\frac{1}{3}$ of 15 or 5 days, and $\frac{2}{3}$ in 8 times 5 or 40 days. As Patrick can dig 40 rods in 24 days, he can dig

$\frac{1}{4}$ of 40 or $1\frac{3}{4}$ rods in 1 day, and since Peter can dig 40 rods in 40 days, he can dig 1 rod a day, and it will take him as many days as $1\frac{3}{4} + 1 = 2\frac{3}{4}$ is contained times in 28, or $10\frac{1}{2}$ days.

17. Since 30 rods is $\frac{3}{4}$ of 40 rods, it will take each man $\frac{3}{4}$ as long to dig it. Since Patrick could dig it in 40 days, he can dig 30 rods in $\frac{3}{4}$ of 40 or 30 days; since Peter can dig it in 24 days, he can dig 30 rods in $\frac{3}{4}$ of 24 or 18 days; and since Philo can dig it in 30 days, he can dig 30 rods in $\frac{3}{4}$ of 30 or $22\frac{1}{2}$ days.

18. Henry's work is divided into 4 equal parts, and since Harlan's exceeds Henry's by 1 of these parts, he must do 5 parts, and both of them $4 + 5$ or 9 parts. Since Henry cuts $\frac{1}{4}$ of it in $6\frac{2}{3}$ or $2\frac{2}{3}$ days, he can cut $\frac{1}{9}$ in $\frac{1}{4}$ of $2\frac{2}{3}$ or $\frac{2}{3}$ days, and $\frac{2}{9}$ in 9 times $\frac{2}{3}$ or 15 days. Since Harlan cuts $\frac{1}{5}$ of it in $6\frac{2}{3}$ or $2\frac{2}{3}$ days, he can cut $\frac{1}{9}$ in $\frac{1}{5}$ of $2\frac{2}{3}$ or $\frac{2}{3}$ days, and $\frac{2}{9}$ in 9 times $\frac{2}{3}$ or 12 days.

19. Since the 3d does $\frac{2}{3}$ as much as the 1st and 2d, the work of the 1st and 2d is divided into 5 parts; and since the 3d does $\frac{2}{3}$ as much, the whole is divided into $5 + 2$ or 7 parts. Since the 3d does $\frac{2}{3}$ of the whole in 10 days, he can do $\frac{1}{7}$ in $\frac{1}{2}$ of 10 or 5 days, and $\frac{2}{7}$ in 7 times 5, or 35 days. Since the 1st and 2d do $\frac{1}{7}$ in 10 days, they can do $\frac{1}{7}$ in $\frac{1}{2}$ of 10 or 5 days, and $\frac{2}{7}$ in 7 times 5 or 35 days. And since the 1st does $\frac{2}{3}$ as much as the 2d, the whole is divided into 7 parts, of which the 1st does 3, and the 2d 4 parts. Since the 1st does $\frac{2}{3}$ in 14 days, he can do $\frac{1}{7}$ in $\frac{1}{3}$ of 14 or $4\frac{2}{3}$ days, and $\frac{2}{7}$ in 7 times $4\frac{2}{3}$ or $32\frac{2}{3}$ days. Since the 2d does $\frac{1}{7}$ in 14 days, he can do $\frac{1}{7}$ in $\frac{1}{4}$ of 14 or $3\frac{1}{2}$ days, and $\frac{2}{7}$ in 7 times $3\frac{1}{2}$ or $24\frac{1}{2}$ days.

20. See Analysis of example 19.

21. Since the 1st can do it in $32\frac{2}{3}$ or $2\frac{2}{3}$ days, he can do $\frac{1}{3}$ of it in $\frac{1}{3}$ of a day or $\frac{1}{9}$ in a day; and since the 3d can do it in 35 days, he can do $\frac{1}{35}$ of it in 1 day; and both can do $\frac{1}{9} + \frac{1}{35}$ or $\frac{44}{315}$ in 1 day, and the whole in as many days as 29 is contained times in 490 or $16\frac{1}{2}$ days.

22. Since the 2d can do it in $24\frac{1}{2}$ or $4\frac{1}{2}$ days, he can do $\frac{1}{4\frac{1}{2}}$ of it in $\frac{1}{2}$ of a day, or $\frac{2}{9}$ in a day; and since the 3d can do $\frac{1}{3}$ of it in 1 day, the 2d and 3d can do $\frac{2}{9} + \frac{1}{3}$, or $\frac{5}{9}$ of it in 1 day, and they can do all of it in as many days as 17 is contained times in 245, or $14\frac{7}{7}$ days.

23. Since B and C can do it in 12 days, they can do $\frac{2}{3}$ or $\frac{2}{3}$ of it in 8 days, and A must do the other $\frac{1}{3}$; and since A can do $\frac{1}{3}$ in 8 days, he can do $\frac{2}{3}$ in 3 times 8 or 24 days. Since A and B can do it in 10 days, they can do $\frac{2}{5}$ or $\frac{2}{5}$ of it in 8 days, and C must do the other $\frac{1}{5}$; and since C can do $\frac{1}{5}$ in 8 days, he can do $\frac{2}{5}$ in 5 times 8, or 40 days. Since A can do it in 24 days, he can do $\frac{1}{24}$ or $\frac{1}{12}$ of it in 10 days, and B must do the remaining $\frac{7}{12}$; and since B can do $\frac{7}{12}$ in 10 days, he can do $\frac{1}{12}$ in $\frac{1}{7}$ of 10 or $1\frac{2}{7}$ days, and $\frac{1}{2}$ in 12 times $1\frac{2}{7}$ or $17\frac{1}{7}$ days.

24. Since the 1st and 2d will discharge it in 8 hours, they discharge $\frac{2}{3}$ or $\frac{2}{3}$ of it in 4 hours, and the 3d must discharge the other $\frac{1}{3}$; and since it discharges $\frac{1}{3}$ in 4 hours, it will discharge $\frac{2}{3}$ in 2 times 4, or 8 hours. Since the 3d will discharge it in 8 hours, it discharges $\frac{2}{3}$ or $\frac{2}{3}$ of it in 6 hours, and the 1st must discharge the other $\frac{1}{3}$; and since the 1st discharges $\frac{1}{3}$ of it in 6 hours, it will discharge $\frac{2}{3}$ in 4 times 6 or 24 hours. Since the 1st and 3d discharge it in 6 hours, they will discharge $\frac{2}{3}$ or $\frac{2}{3}$ of it in 4 hours, and the 2d must discharge the other $\frac{1}{3}$; and since the 2d discharges $\frac{1}{3}$ in 4 hours, it will discharge $\frac{2}{3}$ in 3 times 4 or 12 hours.

25. Since A and B can do it in 20 days, they do $\frac{1}{2}$ or $\frac{1}{2}$ of it in 10 days, and C does the other $\frac{1}{2}$; and since C does $\frac{1}{2}$ in 10 days, he can do $\frac{1}{2}$ in 2 times 10 or 20 days. Since B and C can do it in 15 days, they do $\frac{2}{3}$ or $\frac{2}{3}$ of it in 10 days, and A does the other third; and since A does $\frac{1}{3}$ in 10 days, he can do $\frac{2}{3}$ in 3 times 10 or 30 days. Since A can do it in 30 days and C in 20 days, they can both do $\frac{1}{30} + \frac{1}{20}$ or $\frac{1}{12}$ of it in 1 day, and $\frac{1}{2}$ in 12 times 1 or 12 days.

26. Since it would last them all 30 days, they would eat $\frac{1}{30}$ of it in 1 day, and 20 times $\frac{1}{30}$ or $\frac{2}{3}$ of it in 20 days, leaving $\frac{1}{3}$

of it to be eaten by the sister. Since the brother and servant would eat it in 45 days, they would eat $\frac{2}{3}$ or $\frac{2}{3}$ of it in 30 days, and the sister must eat the other $\frac{1}{3}$ in 30 days.

101.

2. Since 2 plums was the increase given to 1 playmate, and $9-1$ or 8 plums the increase given to all, there were as many playmates as 2 is contained times in 8, which is 4 times. Therefore, etc.

3. Since the difference between 6 times and 3 times a number is 3 times the number, 15 must be 3 times the number, and $\frac{1}{3}$ of 15, or 5 must be the number. Therefore, etc.

4. Since the difference per yard was 12 cents—8 cents, or 4 cents, she wanted as many yards as 4 is contained times in the whole difference, 11 cents+17 cents, or 28 cents, which is 7 times.

5. Since the difference between $6\frac{1}{2}$ times and 4 times a number is $2\frac{1}{2}$ times or $\frac{5}{2}$ times the number, 15 must be $\frac{4}{5}$ times the number; $\frac{1}{5}$ of 15 or 3, $\frac{1}{2}$; and 6, the number.

6. Since $\frac{5}{3}-\frac{1}{3}=\frac{4}{3}$, $\frac{1}{3}$ of 4 or 2 must be $\frac{1}{3}$ and 9 times 2 or $18=\frac{2}{3}$.

7. Since the difference between $5\frac{1}{2}$ times and $3\frac{2}{3}$ times a number is $\frac{7}{6}$ times the number, $\frac{1}{7}$ of 21, or 3, must be $\frac{1}{6}$, and 10 times 1, or 10, $\frac{1}{6}$, or the number.

9. If we let 1 or $\frac{2}{3}$ represent the whole number of chickens, $\frac{2}{3}$ times 5 + $\frac{1}{3}$ times 3 = $\frac{13}{3}$, will represent the whole number of grains, that is, $\frac{13}{3}=26$. And since 26 is $\frac{13}{3}$ times the number of chickens, $\frac{2}{3}$ or the whole number of chickens, was 3 times $\frac{1}{3}$ of 26, or 6.

10. Since 26 is 5 times $\frac{2}{3}+3$ times $\frac{1}{3}$, or $\frac{13}{3}$ of the number, $\frac{1}{13}$ of 26 or 2 is $\frac{1}{3}$, and 3 times 2 or 6 is $\frac{2}{3}$ or the number. Therefore, etc.

11. Since the 1st condition gives 5 times $\frac{1}{3}$ of a number, plus the 2d condition, which gives 3 times $\frac{1}{3}$ of the same number, plus the 3d, which gives 2 times $\frac{2}{3}$ of the same number,

plus the 4th, which gives once $\frac{1}{3}$ the same number; we have $\frac{2}{3}$ of the class equal to 29, and $\frac{1}{3}$ of 29 or 1 is $\frac{1}{3}$ of 9 times 1 or 9. Therefore, etc.

13. Since 4 times $\frac{1}{2}$ of a number, plus $3\frac{1}{2}$ times the number, or $\frac{11}{2}$ times the number, is equal to 28 plus 5, or 33, $\frac{11}{2}$ of 33, or 3 is $\frac{1}{2}$ of the number, and 2 times 3 or 6 is the number. Therefore, etc.

14. Since the 1st condition gives $\frac{1}{3}$ of his age plus 4, the 2d gives $\frac{2}{3}$, and the 3d gives $\frac{2}{3}$ less 4, we have the sum $\frac{1}{3}$ equal to 50; $\frac{1}{3}$ of 50 or 5 is $\frac{1}{3}$ of his age, and 3 times 5 or 15 is $\frac{2}{3}$. Therefore, etc.

15. Since he paid \$5 a head for $\frac{1}{3}$ of the flock, the cost = 5 times $\frac{1}{3}$ or $\frac{5}{3}$ of his flock; \$4 a head for as many more = 4 times $\frac{1}{3}$ or $\frac{4}{3}$ of his flock; \$3 a head for $\frac{1}{2}$ of the remainder, or $\frac{1}{2}$ = 3 times $\frac{1}{3}$ or $\frac{1}{2}$ of his flock; and \$2 a head for the rest, or $\frac{1}{2}$ = 2 times $\frac{1}{3}$ or $\frac{1}{3}$ of his flock; and $\frac{5}{3} + \frac{4}{3} + \frac{1}{2} + \frac{1}{3} = \frac{26}{6}$. That is, the number of dollars the flock cost = $\frac{26}{6}$ of the number of sheep, and 115 is $\frac{26}{6}$ of 6 times $\frac{1}{3}$ of 115 which is 30. Therefore, etc.

16. Since he received 6 dimes
each for $\frac{1}{4}$ = $\frac{1}{4} \times 6 = \frac{3}{2}$
for $\frac{1}{2}$ of the remaining $\frac{3}{2}$ and 3 more,
4 dimes each = $(\frac{3}{2} + 3) \times 4 = \frac{24}{2} + 12$ dimes
for $\frac{1}{3}$ of the rest (which is $\frac{3}{2}$ less 1
on each eight), or $\frac{1}{3} + 1$ = $(\frac{1}{3} + 1) \times 3 = \frac{10}{3} + 3$ "
for the rest (which is $\frac{2}{3}$ less 1 on
each eight, also the 2 of last sale),
or $\frac{2}{3}$ less 4 = $(\frac{2}{3} - 4) \times 2 = \frac{4}{3} - 8$ "
the whole number of dimes is equal

to $\frac{31}{6}$ of the baskets and 7 dimes besides, .. = $\frac{31}{6} + 7$ "
hence \$10 or 100 dimes less 7 dimes = 93 dimes = $\frac{31}{6}$, $\frac{1}{3}$ of
93 or 3 = $\frac{1}{3}$, and 8 eighths, 8 times 3 or 24. Therefore, etc.

18. 6 times a number equals $\frac{24}{4}$, 7 times $\frac{2}{3}$ of it plus 5
times $\frac{1}{4}$ of it equals $\frac{24}{4}$, and $\frac{24}{4}$ less $\frac{24}{4} = \frac{2}{4}$ or $\frac{1}{2}$ of it, which,

according to the condition of the question, is 4; and 4 is $\frac{1}{2}$ of 2 times 4 or 8. Therefore, etc.

19. 5 times the number, or $2\frac{1}{2}$, left 4 cents, but 5 times $\frac{3}{4}$ of it, or $1\frac{1}{2}$, plus 7 times $\frac{1}{4}$ of it, or $2\frac{1}{2}$ was it all of it; and by the condition of the question $2\frac{1}{2}$ less $2\frac{1}{2}$ or $\frac{1}{2}$ equals 4; and $\frac{3}{2}$ is 2 times 4 or 8. Therefore, etc.

20. 4 times a number equals $2\frac{3}{4}$, 5 times $\frac{4}{7}$ of it equals $2\frac{1}{7}$, and $2\frac{1}{7}$ less $2\frac{3}{4}$ equals $\frac{3}{7}$ of it, which by the question is 6; and 6 is $\frac{3}{7}$ of 7 times $\frac{1}{3}$ of 6, which is 14. Therefore, etc.

21. 2 times a number equals $\frac{4}{5}$ of it, 5 times $\frac{1}{2}$ of it equals $\frac{5}{2}$, and this plus 2 times $\frac{1}{2}$ of it—which is $\frac{3}{2}$ —equals $\frac{7}{2}$ of it, and $\frac{7}{2}$ less $\frac{4}{5}$, equals $\frac{3}{2}$ of it, which by the conditions of the question is 60; and 60 is $\frac{3}{2}$ of 2 times $\frac{1}{3}$ of 60 which is 40. Therefore, etc.

22. 2 times $\frac{3}{4}$ of a number equals $\frac{4}{5}$ of it, which is 8 more than $\frac{4}{5}$; hence 8 is $\frac{1}{5}$ or $\frac{1}{5}$ of it, and 2 times 8 or 16 is the whole of it. Therefore etc.

102.

2. Since 19 is the sum of two numbers whose difference is 3, 19 less 3, or 16, is twice the less number; $\frac{1}{2}$ of 16 is 8, the less number, which, increased by 3, equals 11, the greater number. Therefore, etc.

3. Since 31 is the sum of two numbers whose difference is 9, 31 less 9 or 22, is twice the less number; $\frac{1}{2}$ of 22 or 11 is the less number, which, increased by 9, equals 20, the greater number. Therefore, etc.

4. Since $37\frac{1}{2}$ is the sum of two numbers whose difference is $5\frac{1}{2}$, $37\frac{1}{2}$ less $5\frac{1}{2}$ or 32, is twice the less number; $\frac{1}{2}$ of 32 is 16 the less number, which, increased by $5\frac{1}{2}$, equals $21\frac{1}{2}$, the greater number. Therefore, etc.

5. Since 21 is the sum of two numbers whose difference is 5, 21 less 5 or 16, is twice the less number; $\frac{1}{2}$ of 16 is 8; the number Homer had at first, plus 3, equals 11, or what

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he has now ; and 21 less 11, or 10, equals what Horace has now. Therefore, etc.

6. Since Mary has twice as many as Martha, she has 2 parts, and Martha 1, they both have 3 parts; $\frac{1}{3}$ of 12 quarts or 4 quarts, equals what Martha has, and twice 4 or 8 quarts equals what Mary has. Therefore, etc.

7. Since 47 is the sum of two numbers, one of which is 5 more than twice the other, 47 less 5, or 42, equals 3 times the less number; $\frac{1}{3}$ of 42 or 14, equals the less, and twice 14 or 28 plus 5, which is 33, equals the greater. Therefore, etc.

8. If the small bin held 6 bushels more, it would contain $\frac{1}{2}$ as much as the other, and both would hold 60 bushels, or 3 times as much as the small one; $\frac{1}{3}$ of 60 or 20, less 6, which is 14, equals the number of bushels in the smaller bin, and 2 times 20 or 40, equals the number in the larger bin. Therefore, etc.

9. Had the watch cost \$4 more, both would have cost \$100, or 4 times the cost of the chain; $\frac{1}{4}$ of \$100, or \$25, equals the cost of the chain, and \$96 less \$25, or \$71, equals the cost of the watch. Therefore, etc.

10. Since Hiram received 11 times 2, or 22 dimes more than Harvey, 253 dimes, what both received, less 22 dimes, or 231 dimes, equals twice what Harvey received; $\frac{1}{2}$ of 231, or 115 $\frac{1}{2}$ dimes equals what Harvey received, and 115 $\frac{1}{2}$ dimes, plus 22 dimes, or 137 $\frac{1}{2}$ dimes equals what Hiram received; $\frac{1}{11}$ of 115 $\frac{1}{2}$ dimes, which is \$1.05, equals what Harvey received per day; and \$1.05, increased by 2 dimes, equals \$1.25, what at Hiram received. Therefore, etc.

11. Since B's age was 2 times A's 6 years since, 48 years, the sum of their ages then, must have been 4 times A's age; $\frac{1}{4}$ of 48, which is 12, plus 6, or 18 years, equals A's age; and 60 less 18, or 42 years, equals B's age. Therefore, etc.

12. Since the horse cost \$4 more than 3 times the cost of the cow, \$124 less \$4, or \$121, is 4 times the cost of the cow; $\frac{1}{4}$ of \$121, or \$30.25, equals the cost of the cow,

and \$124 less \$30.25, or \$93.75, equals the cost of the horse. Therefore, etc.

13. Since the product is the same whichever factor be taken for the multiplicand, we will use $\frac{1}{4}$ of the cost of the cow, which taken 4 times, equals $\frac{1}{4}$ or the whole cost; hence, $\frac{1}{2}$ of the cost of the colt must be \$4; twice \$4, or \$8, equals what he paid for the colt; and \$24 less \$8, or \$16, equals what he paid for the cow. Therefore, etc.

14. Since the cost of the cover (which by a condition of the question is $\frac{1}{2}$ as much as the dish plus the difference), increased by the difference, equals the cost of the dish, the dish costs twice the difference plus $\frac{1}{2}$ of itself, or the difference equals $\frac{2}{3}$ of the cost of the dish; and $\frac{2}{3}$ less $\frac{2}{3}$, or $\frac{1}{3}$ of the cost of the dish equals the cost of the cover; and 24 dimes equals $\frac{2}{3}$ of the cost of the dish. $\frac{1}{3}$ of 24 dimes = 8 dimes, 5 times 8 = 40 dimes, the cost of the dish; and 24 dimes - 40 dimes = -16 dimes, the cost of the cover.

15. Since the less number,—which by the question equals $\frac{1}{2}$ of the greater plus the difference,—increased by the difference equals the greater, we have the greater equaling $\frac{1}{2}$ of itself plus twice the difference, or the difference equaling $\frac{1}{2}$ of the greater, and $\frac{1}{2} - \frac{1}{2} = 0$ of the greater equals the less; $\frac{1}{2} + \frac{1}{2} = 1$ of the greater equals the less; $\frac{1}{2}$ of 25 pounds, or 12 pounds 6 shillings, is the less number, and 9 times 12 pounds 6 shillings is the greater. Therefore, etc.

16. Since the sum of the difference and the less number equals the greater, the less must equal $\frac{2}{3}$ of the greater, and both numbers $\frac{1}{3}$ of the greater; $\frac{1}{3}$ of 10 = $\frac{10}{3}$ is $\frac{1}{3}$ of the greater number, 3 times $\frac{10}{3}$ is 10, the greater; and 10 less $\frac{10}{3}$, or $\frac{20}{3}$ is the less.

17. Since the cost of ironing, plus $\frac{1}{2}$ of the difference, equals $\frac{1}{2}$ of the cost of the wood-work, the remaining $\frac{1}{2}$ must equal $\frac{1}{2}$ of the difference, and the difference equals $\frac{1}{2}$ of the cost of the wood-work; $\frac{1}{2}$ less $\frac{1}{2}$ equals 0 of the cost of ironing; $\frac{1}{2}$ plus $\frac{1}{2}$, or 1 times the cost of the wood-work equals

\$38. $\frac{1}{11}$ of \$38 or \$2, is $\frac{1}{11}$, 11 times \$2 or \$22, is the cost of the wood-work, and \$38 less \$22 or \$16 is the cost of ironing.

18. Since the cost of the ribbon,—which by the question equals $\frac{1}{2}$ of the cost of the lace, plus $\frac{1}{2}$ the difference, increased by the difference between the cost of the lace and ribbon,—equals the cost of the lace; we have $\frac{1}{2}$ of the cost of the lace equal to $\frac{1}{2}$ of the difference, or the lace costing a sum equal to $\frac{1}{2}$ of the difference, and the ribbon $\frac{1}{2}$ of the difference, and both 30 cents, or 5 times the difference. $\frac{1}{5}$ of 30 cents, or 6 cents, is the difference between the cost of the two; 30 cents less 6 cents or 24 cents, is twice the cost of the ribbon, and $\frac{1}{2}$ of 24 cents or 12 cents is the cost of the ribbon; and 30 cents less 12 cents, or 18 cents is the cost of the lace.

19. Since the whole of the cost of the knife and once the difference equals the cost of the skates, and by the question $\frac{1}{2}$ the cost of the knife plus twice the difference equals the same, once the difference must equal $\frac{1}{2}$ the cost of the knife, twice the difference the *whole* cost, 3 times the difference the cost of the skates, and 5 times the difference equals 20 shillings, or the cost of both; $\frac{1}{5}$ of 20 shillings is 4 shillings, 2 times 4 shillings is 8 shillings, the cost of the knife; and 3 times 4 shillings is 12 shillings, the cost of the skates.

20. Had the harness cost \$1 more, both would have cost \$15, and the horse would cost $\frac{1}{3}$ of \$35 or \$20, and the harness $\frac{2}{3}$ of \$35 or \$15, less \$1 or \$14. Therefore, etc.

103.

2. Had all been old sheep, he would have paid \$84, or \$8 more than he did; each yearling made a difference of \$1, hence there were as many yearlings as \$1 (the difference on 1) is contained times in \$8 (the difference on all), which is 8 times; and 28 less 8 equals 20, the number of old sheep.

3. Had all been first quality, he would have paid \$96, or \$8 more than he did; and since the difference per barrel was

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\$1, he bought as many barrels of poor quality as \$1 is contained times in \$8, or 8 barrels; and 20 less 8 equals 12 first quality.

4. Since he lost $\frac{2}{3}$ of the cost, $\frac{1}{3}$ of \$18 or \$9, must have been $\frac{1}{3}$ of the cost, and 5 times \$9 or \$45, was the whole cost.

5. There were as many of each as 12 dimes (the number it took to pay one of each) is contained times in 72 dimes (the number paid to all). 12 is in 72 6 times, and 2 times 6 is 12, the whole number.

6. Since she received 8 dimes for 1 of each, she sold as many of each as 8 dimes is contained times in 40 dimes, which is 5 times; twice 5 is 10, the number of fowls she sold.

7. He bought as many bushels as \$.50, the difference on 1 bushel of each is contained times in \$7, the difference on all; \$.50 is in \$7 14 times. Therefore, etc.

9. He was idle as many days as \$3.50 (the difference made by 1 idle day) is contained times in \$7 (the difference made by all the idle days), which is 2 times; 20 days less 2 days is 18 days. Therefore, etc.

11. Since she gave $\frac{2}{3}$ of the remainder to her teacher, the 2 left must be the other $\frac{1}{3}$; 4 times 2 is 8, which was the $\frac{1}{3}$ left after division among the playmates, and 4 times 8 or 32 equals the number she had at first. Therefore, etc.

12. $\frac{2}{3}$ of $1\frac{1}{2}$ is $\frac{1}{3}$; hence 12 is $\frac{1}{3}$ of his flock, and 10 times 12, or 120 equals the number of sheep he had at first.

13. Since he paid $\frac{2}{3}$ of the remainder, \$3 must be $\frac{1}{3}$ of it. $\frac{1}{3}$ of \$3 is \$1, and 5 times \$1 is \$5, the remainder, which by the first payment wants \$5 of being $\frac{1}{4}$ of the whole; \$5 plus \$5 is \$10, $\frac{1}{4}$ of the whole, and 4 times \$10 is \$40, the whole. Therefore, etc.

14. Since he lent $\frac{2}{3}$, \$3 plus \$5 or \$8, must have been $\frac{1}{3}$. 3 times \$8 or \$24 is what he had after paying for the watch; \$24 plus \$12 or \$36 equals what he had after paying for his clothes, which lacks \$10 of being $\frac{1}{2}$ of his wages; \$36 plus \$10, or \$46 is $\frac{1}{2}$; and 2 times \$46, or \$92 equals his wages.

15. Since in \$1 there are 10 dimes, he could be idle as many days, for each day he worked, as 2 dimes, what he paid a day for board, is contained times in the amount his daily wages exceeded \$1, which is once; hence he worked $\frac{1}{2}$ of the time, and was idle 10 days.

104.

2. The part standing was divided into 4 equal parts, 3 of which equaled the part broken off; the sum of both pieces was 7 equal parts, 1 of which was $\frac{1}{4}$ of 56 feet or 8 feet, 3 parts were 3 times 8 or 24 feet, which was the part broken off; and 4 times 8 or 32 feet was the part standing. Therefore, etc.

3. Since Henry has 5 parts and Horace 4 parts, both have 9 parts; $\frac{1}{3}$ of 45 is 5; 4 times 5 or 20 equals the number Horace had, and 5 times 5 or 25 equals the number Henry had. Therefore, etc.

4. Since he left 5 parts and took out 3, he left $\frac{2}{3}$ of 160, or 100 pounds. Therefore, etc.

5. Since he paid 5 parts for his lodging and 4 for his supper, his supper cost $\frac{4}{9}$ of 63, or 28 cents. Therefore, etc.

6. Since 9 times $\frac{1}{3} = \frac{2}{3}$ times the cost of wagon, equals the cost of the horse, both cost 8 plus 9, or $\frac{17}{2}$ times the wagon; $\frac{1}{17}$ of \$170 is \$10; 8 times \$10, or \$80 was the cost of the wagon; and 9 times \$10, or \$90 the cost of the horse. Therefore, etc.

7. Since the second day's travel was $1\frac{1}{3} = \frac{4}{3}$ times the first, both equaled $\frac{7}{3}$ times the second; $\frac{1}{7}$ of 140 miles is 20 miles; 3 times 20 equals 60 miles, the second day's travel; and 4 times 20 equals 80 miles, the first day's travel.

8. Since Bergen is 50 miles from Buffalo, 280 miles less 50 or 230 miles equals the distance from Bergen to Schenectady; and as the distance from Utica to Schenectady is $1\frac{2}{3} = \frac{5}{3}$ times the distance from Bergen to Utica, the whole distance from Bergen to Schenectady equals $\frac{1}{3}$ plus $\frac{2}{3}$, or $\frac{3}{3}$; $\frac{1}{3}$ of 230 miles is 10 miles, and 15 times 10, or 150 miles equals the
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distance from Schenectady to Bergen; and 150 miles plus 50 miles, the distance from Bergen to Buffalo, gives 200 miles from Buffalo to Utica.

9. Since the head was 3 inches long, 17 inches less 3 or 14 inches equals the length of the body and the tail; and as the body was divided into fifths, 2 of which equaled the tail, we have body and tail divided into 7 parts; $\frac{1}{7}$ of 14 inches is 2 inches, and 2 times 2 or 4 inches equals the tail.

10. Since the less has 7 parts and the greater 11, both have 18; $\frac{1}{18}$ of 36 is 2; 7 times 2 = 14, the less part; and 11 times 2 = 22, the greater.

12. If the distance from Victor to Rochester were 4 miles less, it would equal the $\frac{5}{7}$ mentioned, and the whole distance would be 52 miles less 4 miles, or 48 miles; from Geneva to Victor is 11 parts, from Victor to Rochester 5 parts, in all 16 parts; $\frac{1}{16}$ of 48 is 3; 11 times 3 miles = 33 miles, the distance from Geneva to Victor; and 52 miles less 33 miles = 19 miles, the distance from Rochester to Victor.

13. If the church were 6 feet lower, the whole distance would be 140 feet, of which the steeple would be 4 parts, the church 3 parts, and both 7 parts; $\frac{1}{7}$ of 140 feet is 20 feet; and 4 times 20 is 80 feet, the height of the steeple. Therefore, etc.

14. Since the jar (which, by a condition of the question, weighs as much as $\frac{1}{2}$ the cover plus 12 pounds) and the cover weighs 18 pounds, we have the cover, $\frac{1}{2}$ the cover and 12 pounds equal to 18 pounds, or $\frac{3}{2}$ of the cover weighing 6 pounds; $\frac{1}{2}$ of the cover, $\frac{1}{2}$ of 6 pounds, or 3 pounds; and $\frac{3}{2}$ times 3 pounds, or 4 pounds; and 18 pounds less 4 pounds, is 14 pounds, the weight of the jar. Therefore, etc.

15. Had the vest cost \$3 less, both had cost but \$16, of which the coat cost 3 parts, the vest 1, both 4 parts; $\frac{1}{4}$ of \$16 is \$4; 3 times \$4 is \$12, the cost of the coat; and \$4 plus \$3, or \$7 is the cost of the vest. Therefore, etc.

17. Since $\frac{1}{2}$ of George's equaled $\frac{3}{4}$ of Abel's, 2 halves would

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equal twice $\frac{3}{4}$, or $\frac{3}{2}$; then Abel had 4 parts, George 6 parts, and both 10 parts; $\frac{1}{10}$ of 50 cents is 5 cents; 6 times 5 cents = 30 cents, George's money; and 4 times 5 cents = 20 cents, Abel's money. Therefore, etc.

18. Since $\frac{2}{3}$ equaled $\frac{4}{6}$, $\frac{1}{3}$ would equal $\frac{1}{2}$ of $\frac{4}{6}$, or $\frac{2}{6}$, and $\frac{2}{3}$ 5 times $\frac{2}{6}$ or $\frac{10}{6}$; then the black ones were 7 parts, the gray ones 10, and both 17; $\frac{1}{17}$ of 34 is 2; 10 times 2 is 20, the number of gray ones; and 7 times 2 is 14, the number of black ones. Therefore, etc.

19. Since $\frac{2}{3}$ equaled $\frac{4}{6}$, $\frac{1}{3}$ would equal $\frac{1}{2}$ of $\frac{4}{6}$, or $\frac{2}{6}$, and $\frac{2}{3}$, 3 times $\frac{2}{6}$ or $\frac{6}{6}$; one number is divided into sixteenths, 15 of which equals the other, and $\frac{15}{16}$ equal both; $\frac{1}{16}$ of 62 is 2; 16 times 2 is 32, the larger number; and 15 times 2 is 30, the smaller number. Therefore, etc.

20. Since $\frac{2}{3}$ equals $\frac{4}{6}$, $\frac{1}{3}$ would equal $\frac{1}{2}$ of $\frac{4}{6}$, or $\frac{2}{6}$, and $\frac{2}{3}$, 4 times $\frac{2}{6}$, or $\frac{8}{6}$; the value of the contents is 15 parts, of the purse 8 parts, and of both 23 parts; $\frac{1}{23}$ of 46 shillings is 2 shillings; 15 times 2 shillings is 30 shillings, the value of the contents; and 8 times 2 shillings is 16 shillings, the value of the purse.

22. Since from midnight to 10 o'clock is 10 hours, and the past time is divided into 3 parts, the future into 2, and the whole into 5, we have 1 part equal to $\frac{1}{5}$ of 10 hours, or 2 hours; and 3 times 2 hours is 6 hours, the past time; hence it was 6 o'clock.

23. Since $\frac{2}{3}$ equals $\frac{4}{6}$, $\frac{1}{3}$ must equal $\frac{1}{2}$ of $\frac{4}{6}$, or $\frac{2}{6}$, and $\frac{2}{3}$, 3 times $\frac{2}{6}$, or $\frac{6}{6}$; from midnight to 5 o'clock, P.M., is 17 hours, and as past time is 8 parts, future 9 parts, and the whole 17 parts, 1 part equals 1 hour, and 8 parts 8 hours; hence it is 8 o'clock, A. M.

24. Since $\frac{2}{3}$ equaled $\frac{4}{6}$, $\frac{1}{3}$ would equal $\frac{1}{2}$ of $\frac{4}{6}$, or $\frac{2}{6}$, and $\frac{2}{3}$, 4 times $\frac{2}{6}$, or $\frac{8}{6}$. John's age was divided into fifths, 4 of which equaled Peter's, and both equaled $\frac{2}{5}$ of John's; $\frac{1}{5}$ of 36 years = 4 years, $\frac{1}{5}$ of John's; 5 times 4 years = 20 years, John's age; and 4 times 4 years = 16 years, Peter's age.

25. Since $\frac{7}{3}$ equalled $\frac{1}{3}$, $\frac{3}{2}$ would equal $\frac{5}{2}$; and we have what was wanting divided into 5 parts, what was in the bin into 6 parts of the same size, and the whole capacity of the bin into 11 parts; $\frac{1}{11}$ of 44 bushels = 4 bushels, 1 part; and 5 times 4 bushels = 20 bushels, what was wanting to fill the bin.

26. Since $\frac{3}{2}$ of what it exceeded equalled $\frac{2}{7}$ of what it lacked, $\frac{4}{3}$ would equal $\frac{1}{7}$; and we have what it lacked divided into 7 parts, what it exceeded into 15, or the whole, 83 miles—39 miles = 44 miles, divided into 22 parts; $\frac{1}{22}$ of 44 miles is 2 miles; 7 times 2 miles is 14 miles, the distance it lacked of being 87 miles; and 83 miles less 14 miles is 69 miles, the distance to Cincinnati.

27. Since $\frac{3}{2}$ of what it lacks of being 150 miles equals what it exceeds 100 miles, we have, the excess, 3 parts plus the deficiency, 2 parts, or 5 parts in all, equal to 150 miles less 100 miles, or 50 miles; $\frac{1}{5}$ of 50 miles is 10 miles; 3 times 10 miles is 30 miles; and 100 miles plus 30 miles = 130 miles, the distance from Charleston to Columbia.

105.

2. Since $\frac{3}{4}$ equal $\frac{4}{7} + 9$, $\frac{1}{4}$ will equal $\frac{1}{3}$ of $\frac{4}{7} + 9$, which is $\frac{4}{7} + 8$, $\frac{4}{7}$, and 4 times $\frac{4}{7} + 3$, which is $\frac{4}{7} + 12$; hence, the mother's age is divided into 7 parts, and 8 of the same size + 12 years equals the father's age, or 15 parts + 12 years equals 72 years; 72 years less 12 years is 60 years, $\frac{1}{3}$ of 60 years is 4 years, and 7 times 4 years equals 28 years, the mother's age.

3. Since $\frac{2}{3}$ equal $\frac{4}{5}$ less 4 rods, $\frac{1}{3}$ will equal $\frac{1}{2}$ of $\frac{4}{5}$ less 4 rods, which is $\frac{2}{5}$ less 2 rods, and $\frac{3}{5}$, 3 times $\frac{2}{5}$ less 2 rods, which is $\frac{6}{5}$ less 6 rods; hence what one built equals 6 rods less than $\frac{4}{5}$ of what the other built, and both built $\frac{1}{5}$ of the amount the second did, less 6 rods; 38 rods plus 6 rods, or 44 rods equals $\frac{4}{5}$; $\frac{1}{4}$ of 44 rods or 4 rods, is $\frac{1}{5}$ of 5 times 4 rods or 20 rods, what the second built; and 38 rods less 20 rods, or 18 rods equals what the first built.

4. Since $\frac{4}{5}$ was 4 more than $\frac{1}{5}$, $\frac{1}{5}$ would be 1 more than $\frac{1}{5}$,

and 7, 7 more than $\frac{7}{5}$; hence what Richard sheared are divided into 5 parts, Hiram's into 7 parts plus 7 sheep, and both into 12 parts plus 7; 67 less 7 is 60; $\frac{5}{12}$ of 60 = 25, the number Richard sheared; 67 less 25 = 42, the number Hiram sheared.

5. Since $\frac{2}{3}$ of future time equaled $\frac{2}{3}$ of the past + $1\frac{2}{3}$ hours, $\frac{1}{3}$ would equal $\frac{1}{3}$ of $\frac{2}{3} + 1\frac{2}{3}$ hours, which is $\frac{1}{3} + \frac{2}{5}$, and $\frac{2}{5}$, 5 times $\frac{1}{3} + \frac{2}{5}$ hours, which is $\frac{5}{3} + \frac{2}{3}$ hours; hence the future time equals $\frac{5}{3}$ hours more than $\frac{2}{3}$ of the past, and both past and future time equal $\frac{5}{3}$ of the past + $\frac{2}{3}$ hours, or 24 hours; 24 hours less $\frac{2}{3}$ hours is $21\frac{1}{3}$ hours, and $\frac{2}{3}$ of $21\frac{1}{3}$ hours is 8 hours, or the past time; hence it was 8 o'clock A. M.

6. Since $\frac{2}{3}$ of what his age lacked of being 100 years equaled $\frac{2}{3}$ of what it exceeded 64 years, + 9 years, $\frac{1}{3}$ of his age would equal $\frac{1}{3}$ of $\frac{2}{3} + 9$ years, which is $\frac{1}{3} + 1$ year, and $\frac{2}{3}$, 8 times $\frac{1}{3} + 1$ year, which is $\frac{8}{3} + 8$ years; hence, what his age lacked of being 100 years equaled 8 years more than $\frac{2}{3}$ of what it exceeded 64 years, and $\frac{1}{3}$ of what it exceeded 64, is 8 years less than the difference between 100 years and 64 years, or 36 years; 36 less 8 is 28 years, $\frac{1}{4}$ of 28 years is 7 years, and 6 times 7 or 42 years, is what his age exceeded 64 years.

8. Since the body is as long as the head and tail, it must be $\frac{1}{2}$ of the length of the fish; the tail being as long as the head and $\frac{1}{2}$ the body, must be $\frac{1}{4}$ of the length of the fish plus 7 inches, and the 7 inches it exceeds the $\frac{1}{4}$ with the 7 inches of the head, must equal the other $\frac{1}{4}$; 14 is $\frac{1}{4}$ of 4 times 14 or 56. Therefore, etc.

9. The first price plus the second, equal to $\frac{1}{2} + 3$ pounds, equals the third price; 2 times $\frac{1}{2} + 3$, equal to $\frac{2}{3}$ of it + 6, equals the whole of it, and 6 pounds must be $\frac{2}{3}$ of it; $\frac{1}{3}$ of 6 pounds or 2 pounds is $\frac{1}{3}$ of it, and 5 times 2 = 10 pounds is the whole of it.

Or it may be solved like the following.

10. Since the third dug as many as the other two, he dug $\frac{1}{2}$, and as the first two dug $\frac{1}{3}$ less 2 bushels + 5 bushels, or 3 bushels more than $\frac{1}{3}$, those 3 bushels must equal the difference

between $\frac{1}{2}$ and $\frac{1}{3}$ of them, or $\frac{1}{6}$ of them; and 3 bushels is $\frac{1}{6}$ of 6 times 3 bushels which is 18 bushels.

11. Since the distance from Avon to Bath is 12 miles more than the sum of the other two distances mentioned, we have the whole distance equal to $\frac{2}{3}$ of itself + 60 miles; hence $\frac{1}{3}$ of 60 miles or 20 miles is $\frac{1}{3}$ of the distance; and 5 times 20, or 100 miles is the whole distance from Batavia to Corning.

12. Since he took \$24 more than $\frac{1}{3}$ of the whole for sheep and swine, and \$7 less than $\frac{2}{3}$ as much for cattle, he took for the cattle \$2 more than $\frac{1}{3}$ of the whole; and we have \$18 + $\frac{1}{3}$ of the whole, + \$6, + $\frac{1}{3}$ of the whole + \$2, or $\frac{1}{24}$ of the whole + \$26, equal to the whole amount; hence $\frac{1}{13}$ of \$26, or \$2 is $\frac{1}{24}$, and 24 times \$2, or \$48 is what he took for all.

13. Of $\frac{1}{2}$ that number of which $\frac{1}{3}$, of $\frac{1}{3}$ and $\frac{1}{2}$ of $\frac{1}{3}$ of 12 is $\frac{1}{8}$. $\frac{1}{3}$ and $\frac{1}{2}$ of $\frac{1}{3}$ of 12 is 6, $\frac{1}{3}$ of 6 is 2, and 2 is $\frac{1}{8}$ of 8 times 2, or 16. Therefore, etc.

14. Since he earned $\frac{3}{4}$ as much as he had spent, he only lacks $\frac{1}{4}$ of $\frac{2}{3} = \frac{1}{6}$ of the whole, of having as much as he had at first; \$16.50 is $\frac{1}{6}$ of 6 times \$16.50, or \$99. Therefore, etc.

15. Since $\frac{2}{3}$ equal $\frac{4}{6}$, $\frac{1}{6}$ will cost $\frac{1}{4}$ of $\frac{1}{3}$ of an eagle, or \$2.

16. Since C is $\frac{2}{3}$ as old as A, he is 4 years more than $\frac{1}{3}$ as old as B; and as B's age equals the sum of A's and C's, we have $\frac{1}{3}$ of it plus 6 years, plus $\frac{1}{3}$ of it plus 4 years, or $\frac{2}{3}$ of it + 10 years, equal to itself; hence 10 years must be $\frac{1}{6}$ of B's age, and 6 times 10 years is 60 years B's age; $\frac{1}{2}$ of 60 is 30, 30 + 6 is 36, A's age; and $\frac{2}{3}$ of 36, or 24 is C's age.

17. Since C owns $\frac{1}{2}$ as much as A, he owns 6 acres more than $\frac{2}{3}$ as much as B; and we have what A owns, 12 more than $\frac{2}{3}$ as many acres as B, + what C owns, 6 more than $\frac{2}{3}$ at many acres as B, equal to 18 more than $\frac{2}{3}$ as many acres as B owns, or 24 acres more than his farm; hence 6 acres equals $\frac{1}{6}$ of B's farm, 8 times 6 is 48 acres, B's; $\frac{2}{3}$ of 48 is 36 acres, and 36 + 12 equals 48 acres or A's; and $\frac{1}{2}$ of 48, or 24 acres equals C's.

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2. Since the son's age is $\frac{2}{3}$ of the father's, the 22 years the father's age exceeds the son's must be $\frac{1}{3}$ of the father's age; 3 times 22 years is 66 years, the father's age, and 66 years less 22 years equals 44 years, the son's age; at the son's birth the father was 22 years old, in 22 years from that time each would be 22 years older, and the son being 22, and the father 44 years of age, would answer the condition of the question, and as the son is 44 now, 44 years less 22 years, or 22 years since, he was $\frac{1}{2}$ as old as his father.

3. At Helen's birth her sister was 22 less 9, or 13 years of age, and in 13 years from that time Helen would be 13 and her sister 2 times 13, or 26 years of age; and as Helen has advanced through 9 of 13 years, she has 13 less 9 or 4 years more to advance.

Or, for brevity, 2 times 9 is 18; 22 less 18 is 4. Therefore, etc.

5. Since he took as many from one field and put in the other as were there, and now both have twice as many as were there at first, the 60 sheep must have been three times the number before removing; $\frac{1}{3}$ of 60 is 20, the number in the smaller; and 20 plus 60, the number in the larger flock, equals 80, the whole number.

6. Since both bins now contain the same quantity, and each 2 bushels more than twice what was in the less at first, the larger must have had 4 bushels more than 3 times the less; 52 less 4 is 48 bushels, $\frac{1}{3}$ of 48 is 16 bushels, what was in the less; and 16 bushels + 52 bushels, what was in the larger, equals 68 bushels. Therefore, etc.

7. $\frac{7}{8}$ less $\frac{2}{3}$ is $\frac{5}{24}$, which by the condition of the question, is 6 more than $\frac{1}{6}$ of his age; $\frac{5}{24}$ less $\frac{1}{6}$ is $\frac{1}{12}$, 6 is $\frac{1}{12}$ of 72. Therefore, etc.

8. Since he received $\frac{1}{3}$ of his wages for his summer's labor, $\frac{1}{3}$ as much, or $\frac{1}{6}$ of them in fall + \$20, and \$20 in spring, \$20 + \$20 = \$40 must be $\frac{2}{3}$ or $\frac{1}{3}$ of his wages, and 3 times \$40 = \$120, must be the whole amount.

10. Since A sold B $\frac{3}{4}$ as much as B had, B now has $\frac{1}{4}$ of what he had at first, which is $\frac{3}{4}$ of what A has left; $\frac{1}{3}$ of $\frac{1}{4} = \frac{1}{12}$ is $\frac{1}{4}$; and 4 times $\frac{1}{12}$, or $\frac{1}{3}$ what A has now = $\frac{2}{3}$, what A has left; $\frac{2}{3}$ plus the $\frac{3}{4}$ sold B, gives A $\frac{17}{12}$ of B's before the sale; $\frac{1}{3}$ of 74 is 2, and 12 times 2 is 24, the number of acres B had before the sale; and 24 acres plus $\frac{3}{4}$ of 24 acres equals 42 acres, what he now has; and 74 less 18 acres leaves 56 acres, what A has left.

11. Since $\frac{2}{3}$ equal $\frac{1}{2}$, $\frac{1}{3}$ will equal $\frac{1}{2}$ of $\frac{1}{2}$ or $\frac{1}{4}$, and $\frac{3}{4}$, 3 times $\frac{1}{4}$ or $\frac{3}{4}$; hence as the turkeys equal $\frac{3}{4}$ of the chickens, 10 must be the remaining $\frac{1}{4}$; 4 times 10 is 40. Therefore, etc.

12. Since $\frac{2}{3}$ of the price of the coat equaled $\frac{1}{4}$ of the price of the suit, $\frac{1}{3}$ would equal $\frac{1}{2}$ of $\frac{1}{4}$ or $\frac{1}{8}$, and $\frac{3}{8}$, 3 times $\frac{1}{8}$ or $\frac{3}{8}$ of the suit; and since the coat cost $\frac{2}{3}$ of the price of the suit, \$15 must be $\frac{2}{3}$ of it; $\frac{1}{3}$ of \$15, or \$5 is $\frac{1}{3}$, and $\frac{2}{3}$ are 8 times \$3 or \$24. Therefore, etc.

13. Since $\frac{2}{3}$ times his brother's equaled $\frac{1}{3}$ of his, $\frac{1}{3}$ would equal $\frac{1}{2}$ of $\frac{1}{3}$ or $\frac{1}{6}$ of his; $\frac{2}{3}$, which is 3 times $\frac{1}{6}$, or $\frac{2}{6}$ and the 14 more must be the remaining $\frac{4}{6}$; $\frac{1}{6}$ of 14 is 2; 10 times 2 or 20 equals what Daniel caught, and 20 less 14 equals 6, what his brother caught.

14. Since by the conditions of the question we have $\frac{1}{2}$ of $3\frac{1}{2}$ times a number + 15, equal to once the number + 15, or, to avoid fractions, 2 times a number + 30, equal to $3\frac{1}{2}$ times the same number + 15, 2 times the number is equal to 2 times the same number, leaving 30 equal $1\frac{1}{2}$ times the number + 15, or 15 equal to $\frac{2}{3}$ of the number; $\frac{1}{3}$ of 15 or 5 is $\frac{1}{2}$ of it; 2 times 5, or 10 is the less number; and $3\frac{1}{2}$ times 10, or 35 is the larger.

15. Since $\frac{1}{2}$ equal $\frac{2}{3}$, $\frac{1}{3}$ will equal $\frac{1}{4}$ of $\frac{2}{3}$, or $\frac{1}{6}$; and $\frac{5}{6}$, 5 times $\frac{1}{6}$ or $\frac{5}{6}$; and as the buggy cost $\frac{2}{3}$ as much as the horse, the difference, \$40, must be $\frac{1}{3}$ of the cost of the horse; 3 times \$40 or \$120 is the value of the horse; and $\frac{2}{3}$ of it, or \$80, is the value of the buggy.

16. 5 years since the mother's age was 5 times Alice's, and

by the first condition we have 5 times Alice's age + 5 (the mother's age) equal to 3 times Alice's age + 15; and since 3 times Alice's age equals 3 times her age, we have 2 times her age + 5 equal to 15, or 2 times her age equal to 10; $\frac{1}{2}$ of 10 is 5, her age; 5 years since + 5 equals 10, her age now; and 3 times 10 or 30 is her mother's age; 2 times 10 is 20, and 30 less 20 is 10, the number of years in which she will be $\frac{1}{2}$ as old as her mother. See Ex. 3, in this lesson.

17. Since Hobart has but $\frac{2}{3}$ of his left, he lost $\frac{1}{3}$ of them to Dwight, which, by the condition of the question, was equal to $\frac{1}{2}$ of Dwight's; $\frac{2}{3}$ must have equaled all of Dwight's; and the 20 Hobart's exceeded Dwight's must have been $\frac{1}{3}$ of Hobart's; 3 times 20 = 60 marbles Hobart had; and 2 times 20 = 40 marbles Dwight had.

18. Since the difference between the numbers is 16, if 4 be taken from the larger difference will be 12, then added to the less it will be but 8; $2\frac{2}{3}$ times this difference, or 19, is equal to $3\frac{1}{6}$ times less $2\frac{2}{3}$ times = $\frac{1}{2}\frac{2}{3}$ times the less number; $\frac{1}{1\frac{1}{2}}$ of 19 or 1 is $\frac{1}{2}\frac{1}{4}$; 24 times 1 = 24, the less number; and 24 + 16 = 40, the larger number.

19. Since he paid twice as much for the rifle as for the watch, and the watch cost \$20, the rifle cost 2 times \$20, or \$40.

20. Since C's age at A's birth was $5\frac{1}{2}$ times B's, and is now equal to the sum of A's and B's ages; and as the increase of C's age would just equal A's age, and B's increase being the same, the increase must have been what B's age lacked of being equal to C's at first, or $4\frac{1}{2}$ times B's age then; hence we have

A's age now equal to $4\frac{1}{2}$ times B's age at first;

B's " " " " $5\frac{1}{2}$ " " " " "

C's " " " " 10 " " " " "

Now if 4 years be added to B's age, $\frac{2}{3}$ of the sum, or $4\frac{1}{2}$ times B's age as first + 3 years, is equal to A's age, and $4\frac{1}{2}$ times B's at first, which gives the 3 years, is equal to $\frac{2}{3}$ of B's age at first; hence B was 8 years old then, and is now $5\frac{1}{2}$ times 8, or 44 years old; A is $4\frac{1}{2}$ times 8, or 36 years old; and C is 10 times 8, or 80 years old.

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2. In as many hours as 2 miles, the number he gained in 1 hour, is contained times 2 times 5 miles, the distance to be gained; 2 times 5 is 10 miles, and 2 is in 10 5 times. Therefore, etc.

3. As many times 9 rods as 2, the number of rods he gains in running 9, is contained times in 28, the number to be gained; 2 is in 28 14 times, and 14 times 9 is 126 rods. Therefore, etc.

4. John will have as many times \$7 as \$2, what he gains on \$7, is contained times in \$30, the whole gain; \$2 is in \$30 15 times, and 15 times \$7 is \$105, what John has saved; and \$105 less \$30 is \$75, what Henry has saved.

5. Since the distance B ran is divided into eighths, 1 of which equaled the distance he was ahead of A, A must have run $\frac{7}{8}$ as far as B; $\frac{1}{8}$ of $84 = 12$ rods is $\frac{1}{8}$ of the distance B ran, and 8 times $12 = 96$ rods, is B's distance

6. Since \$25 is $\frac{1}{4}$ of what B and C paid, they paid 4 times \$25 or \$100, which, with the \$25 A paid, makes \$125, the cost of the horse; and since B paid $\frac{2}{3}$ as much as A and C, they paid 3 parts and he 2 parts; that is, 5 parts equal the whole cost; $\frac{2}{5}$ of \$125 is \$50, what B paid; and \$50 plus the \$25 A paid equals \$75 which, taken from \$125, leaves \$50, what C paid.

8. Since the minute hand passes over 12 spaces while the hour hand passes over 1, the minute hand gains 11 spaces on the hour hand for every 12 spaces it passes over, and it would pass as many times 12 spaces as 11, the number it gains in passing 12, is contained times in 45 spaces, the number to be gained after 3 o'clock before they are opposite; 11 is in 45 $4\frac{1}{11}$ times, and $4\frac{1}{11}$ times 12 is $49\frac{1}{11}$ spaces. Therefore it would be $49\frac{1}{11}$ minutes past 3 o'clock.

9. Since 3 of the hound's leaps equal 6 of the fox's, 1 will equal $\frac{1}{2}$ of 6, or 2 of the fox's, and 4, 4 times 2, or 8 of the fox's; hence the fox will take as many times 7 leaps as 1, the

number the hound gains on the fox in making 7, is contained times in 40, the number of leaps to be gained; 1 is in 40, 40 times, and 40 times 7 is 280. Therefore, etc.

10. Since the distance the sheep ran was divided into 5 parts, 3 of which equaled the distance between them, the whole distance equaled 8 parts; $\frac{1}{8}$ of 80 rods or 10 rods is 1 part, and 3 times 10 or 30 rods equals 3 parts, or the distance between them.

11. Since the interest at 5 per cent., for 2 years 7 months and 6 days, is $\frac{1}{10}$ of the principal, the amount will be $1\frac{1}{10}$; $\frac{1}{11\frac{1}{3}}$ of \$2260 is \$20, and 100 times \$20 = \$2000, the sum at interest; and since B's money equaled $\frac{2}{3}$ of A's, the whole equaled $\frac{5}{3}$ of A's; $\frac{1}{5}$ of \$2000 is \$400 or $\frac{1}{5}$ of what A had in, which is $\frac{1}{5}$ of all, and 5 times \$400 or \$2000 equals A's; \$400 equaled $\frac{1}{5}$ of what B had in, which is $\frac{1}{5}$ of all, and 8 times \$400 or \$3200 equals B's.

12. Since B's fortune is $1\frac{1}{2}$ times A's, $\frac{1}{2}$ of A's is equal to $\frac{1}{3}$ of B's, and the interest on it for 5 years at 6 per cent. would equal $\frac{1}{10}$ of it $\frac{1}{3}$ of \$600, or \$200, is $\frac{1}{10}$ of 10 times \$200, or \$2000; $\frac{1}{2}$ of \$2000, or \$1000, equals what each had in; 2 times \$1000, or \$2000, equals A's fortune; and 3 times \$1000, or \$3000, equals B's.

13. Since he lost 8 per cent. or $\frac{2}{25}$ of the cost on the sale, he sold for $\frac{23}{25}$ of the cost; hence $\frac{1}{4}$ of his calves and $\frac{2}{5}$ of his sheep cost \$25, and 4 times \$25, or \$100 is the cost of all the calves and $\frac{2}{5}$ of the sheep; this exceeds the whole cost by \$24, which must equal the cost of the $\frac{2}{5}$ of the sheep over the whole number; $\frac{1}{3}$ of \$24 is \$8, and 5 times \$8 is \$40 which would buy 20 sheep at \$2; \$76 less \$40 gives \$36 for calves, which would buy 12 calves at \$3. Therefore, etc.

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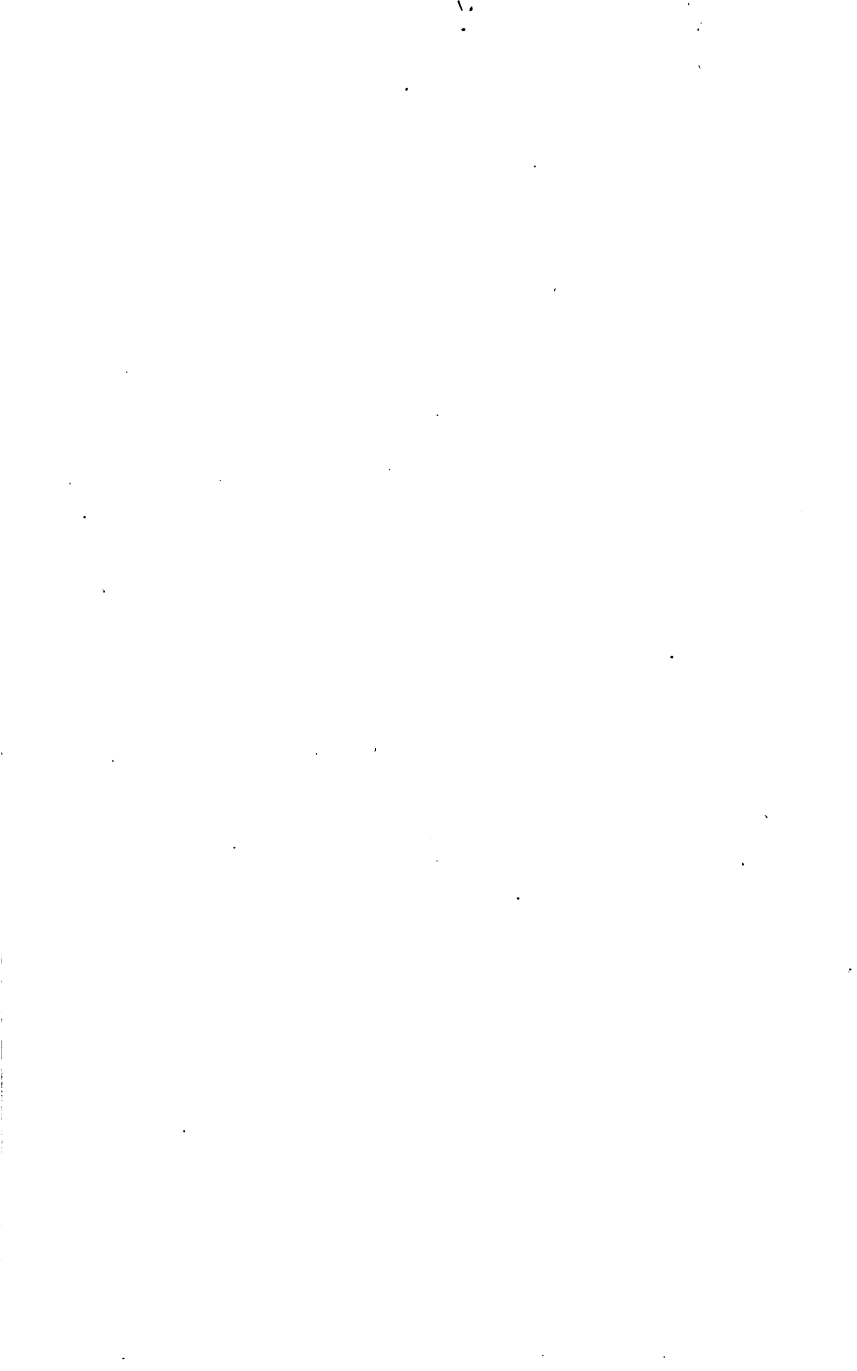
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